

The International Journal of Orthodontia, Oral Surgery and Radiography

(All rights reserved)

VOL. XVIII

ST. LOUIS, JUNE, 1932

No. 6

ORIGINAL ARTICLES

ORTHODONTIA, AN ESSENTIAL PART OF DENTAL EDUCATION*

DR. CH. F. L. NORD, THE HAGUE, HOLLAND

THE history of orthodontia as a science undoubtedly begins with Angle. Before his time a dentist may have been occasionally occupied in regulating a patient's teeth, and, according as he was possessed of knowledge, the result was more or less satisfactory, but there was no question of systematic treatment.

A change took place when Angle's work appeared, which soon became known in all civilized countries, grouping anomalies in a way everyone could understand. Angle brought on the market an apparatus of so simple a nature that the average dentist practically at once familiarized himself with it.

The result was that orthodontic problems were considered to have been solved once for all. The universities gave instruction in orthodontia in addition to the usual subjects, so that the young dentist might believe himself competent to practice this branch of his profession with full knowledge of the subject.

But, as years passed, this latest form of dental treatment proved to be by no means so simple as it had at first been regarded. Not only were good results rare, but the percentage of cases in which an apparently successful treatment turned out to be an utter failure was so high that the general practitioner gradually became chary of treating orthodontic cases, since, by undertaking them, he exposed himself to the danger of losing his reputation as a skillful dentist.

These failures and their causes formed the subject of serious speculation, and the conclusion arrived at was that the orthodontic problem was considerably more complicated than it had been previously regarded, and that a greater amount of knowledge and technical skill was required to deal with it than could be imparted to the young dentist for the successful treatment of the great majority of anomalies.

*A paper presented before the Second International Orthodontic Congress, London, 1931.

In particular, the apparatus gradually grew more complicated, and I need not dwell upon the fact that the simple Angle expansion arch of twenty-five years ago was slowly but surely, via working retainer, pin and tube appliance, etc., being changed into an apparatus which not only is no longer easy to make and apply, but, in the hands of men not specially trained, may prove a danger to the patient.

The same remarks undoubtedly apply to the various forms of lingual arches which were propagated in later years and which could not be successfully applied either, unless—to put it mildly—a special course for the purpose had been followed.

But that was not all. Diagnosis, too, had proved to be of greater importance and more complicated than the determining of the nature of the anomaly alone.

Exact knowledge of the etiologic factors which must have caused the anomaly proved to be necessary for sound therapeutics, and this again necessitated profound study exceeding the knowledge acquired by a student at a university.

The result was that those concerned began increasingly to realize that successful treatment of orthodontic cases was beyond the competency of the general practitioner of dentistry, unless he had a special gift for and love of the subject. This idea became so general in most countries that, on the one hand, in the course of study, little attention was devoted to this branch of science which was considered to be suitable for specialists only, but, on the other, the dentist himself began to believe it could not be expected or demanded of him that he should be master of this part of his profession, and he was frequently able to reconcile his conscience in declining to undertake the treatment of such cases.

In my opinion there is every reason to doubt that this state of things was in the interest of the little disfigured patients.

Fortunately a change is taking place, and it looks as though the period which left orthodontia in the hands of a few specialists who could only treat a limited number of the children of the upper classes in the large towns has ended. For it may be emphatically stated here that however great the blessings of modern operative dentistry may be to man, there is still available the bridge or plate, which can deliver him from the majority of his complaints. The child who has not had treatment and is deprived of the benefits of orthodontia will, however, in many cases, be condemned to suffer the lot of those poor beings whose outward appearance may result in their careers suffering shipwreck and their happiness being destroyed. Consequently there is no part of the dentist's work conceivable which can yield him so much satisfaction and promote the social utility of this profession as orthodontia.

The gratifying change in orthodontic ideas I have just mentioned consists in the fact that as the days go by, the conviction is gaining ground that the orthodontic problem is not a mechanical but a biologic one. This explains why, in announcements of new appliances, we frequently read that they do not exercise a purely mechanical but a biologic effect.

Whether this is always quite the case, is a matter we need not discuss here, but it is certainly a matter for gratification that the most competent authorities admit that biologic treatment is necessary if satisfactory results are to be achieved.

We are safe in assuming that that changed view will result in the apparatus becoming considerably more simple, and that the profession will begin to understand that nature will take care of itself if only it be given the chance to do so.

This biologic consideration has further led to the recognition of the utility of intervention at an early age, with the natural consequence of greater attention being devoted to the deciduous teeth.

And now not only is the untenability apparent of the old thesis that anomalies of the deciduous denture do not or only rarely occur, but conversely the thesis must run that the great majority of irregularities in the position of the teeth find their origin in abnormal conditions of the deciduous denture.

From this it follows that timely treatment of the deciduous denture will prevent many defects later in life, and it again needs no argument to show that this treatment can be considerably more simple than that of the permanent teeth. I need not refer here to or go into the work of men like Korkhaus and Schwarz to enable you to realize the truth of this statement. But from this it also follows that the future solution of the orthodontic problem cannot be left to specialists, no matter how great their number may be, because the recognition of defects in the denture of the young, nay, the very young child, will obviously have to be the task of the practitioner, to whom they regularly come for treatment, and who will, in many cases, be able to prevent serious anomalies by simple measures, such as the insertion of fillings, grinding, and, in a rare case, the extraction of deciduous elements, the raising of the bite, etc. This will, however, only be possible if the practitioner is quite convinced of the importance of such action, *but, above all, if he possesses sufficient orthodontic knowledge to enable him to observe these things.*

Hence, far from the possibility of eliminating orthodontia from the program of study of the future dentist, the student, far more than has hitherto been the case, will have his attention directed to this very important branch of his future profession to prepare him to practice it. Of course there will always have to be specialists to treat the complicated and neglected cases, just as there are now specialists for the extraction of impacted teeth, etc., but the great majority of cases must be traced and malocclusion prevented *in the young child by the general practitioner!*

This brings me to the end of my paper, which pretends to be nothing more than a protest against the tendency to regard orthodontia as a science standing alongside, nay, even outside dentistry, and I desire to point out that, on the contrary, it is now more than ever certain that it will constitute the foremost duty of the dentist to devote his full attention to this most important part of his profession, both during his studies and in his practice.

Summarizing, I should like to say that, contrary to the opinion very often expressed in recent literature, that the practice of orthodontia should only be

exercised by specialists, it is my firm belief that orthodontia is an essential part of dentistry and must be exercised by the general practitioner in the same way as operative or prosthetic dentistry is practiced.

Modern ideas in orthodontia and the biologic tendency in the development of this science demand that considerable attention be given to the deciduous denture and the changes thereof, so that through early treatment it will be possible, with little trouble and cost, to prevent complicated anomalies at a later age. It will be clear that the general practitioner must then be able to diagnose these changes and that he will therefore be obliged to possess a thorough orthodontic knowledge which will have to be imparted during his course of study.

As the dentist is the man who has the children under treatment at an early age, it can only be in this way that orthodontic help can be given to the masses, and everyone will agree that orthodontia would be of very little use if it had to be limited to a few cases of children of well-to-do parents.

In complicated cases the help of specialists will be required, as is now true in oral surgery, but if we desire to bring the blessings of orthodontic knowledge to the people, it will be the general practitioner of dentistry who will have to do it.

THE PLACE OF ORTHODONTIA IN DENTAL EDUCATION*

LEROY M. S. MINER, D.M.D., M.D., F.A.C.S., BOSTON, MASS.

MY APPROACH to this subject, which most of you will agree is of more than passing importance, is not as an expert orthodontist, and I hasten to disclaim any such distinction, but rather as one actively sympathetic to the problems of orthodontia who has been charged with the responsibility of stabilizing a dental curriculum which must of necessity involve a proper balance—a coordination of the various subjects naturally included in this branch of professional education.

The need for earnest effort toward a revision of the general attitude regarding the importance of orthodontia and an improvement in the teaching of it, is emphasized by the results of the studies made by President Hoover's White House Conference on Child Health and Protection. Every aspect of child life in America was studied by a large group of experts in various fields. One committee studying the incidence of malformations of the jaws and teeth found that approximately 85 per cent of the children of the United States and island possessions were suffering from these conditions. Another committee reported wide gaps in our knowledge of the growth and development of the jaws and teeth. The findings of these two committees are directly related. With such a high percentage of incidence of defective development it would be natural to find a deficient knowledge of the factors causing it.

Before any critical discussion of the place of orthodontia in the dental curriculum can be constructive, an analysis of this branch of dentistry must first be made. We must know what it includes—what are its objectives—its aims and purposes.

The approach to the teaching of orthodontia depends to a large extent upon these fundamentals. They will determine whether or not it occupies an important place in the required undergraduate curriculum, is placed among the elective courses, or is eliminated entirely from the undergraduate course and offered only for graduates.

Until quite recently, orthodontia throughout its history has had as its chief objective the correction of malocclusion. This has been accomplished by an evolution of mechanical devices of constantly increasing effectiveness, notable for their ingenuity. Progressive changes from the early crude appliances to the ones of the present day, so amazingly delicate yet accomplishing remarkable results without pain or physical strain to the most sensitive patient, indicate the chief trend of effort which those interested in this field have made to develop therapeutic efficiency.

Concentration on the mechanical problems involved in the correction of malocclusion has naturally fostered the growth of an art—reared on the structure of mechano-therapy—an art that has unfolded from an unimportant bud on the

*A paper presented at the Second International Orthodontic Congress, London, 1931.

branch of mechanical dentistry to the full flower of independence—with the dignity of an important field of clinical practice to which many men of ability devote their entire energy and effort.

Notwithstanding the high development of the art of orthodontia brought about through concentrated attention on mechano-therapy, it has been generally recognized for some time that many gaps exist in the control of malocclusion. The limitations and inadequacies of mechanical treatment, particularly in the preventive aspects, have forced an extension of research efforts to include important studies in several biologic fields. Science has been summoned to the aid of art. As in other divisions of the healing art, it has been found in orthodontia that fundamental biologic processes cannot be disregarded, that a thorough knowledge of cell life and its reactions to varying conditions is necessary before effective preventive or curative measures can be applied.

Take, for example, the matter of function. We know that normal growth and development of the bones of the jaws and face may be seriously interfered with by variations in normal function of these parts. Lawrence Baker, of America, and Richard Landsburger, of Germany, working independently without knowledge of the other's work, demonstrated in laboratory animals how seriously cell growth in the bones of the whole skull can be affected through loss of function of a part of the dental apparatus. Clinical application of these studies has been made notably by Alfred Rogers, of America, who has developed a series of muscle exercises for both the prevention and the early treatment of malocclusion. Through the application of fundamental biologic laws to a specific problem, the necessity of orthodox treatment by mechanical methods will be increasingly less evident.

From what has been said, it is obvious that there are at least two major objectives in orthodontia, frequently sharply disassociated, yet demanding suitable coordination. First, the mechanical; here interest is centered on a constant improvement of mechanical methods and procedures. Second, the biologic; the goal being a constant extension of knowledge of cell behavior shedding light on the causes of defects of growth and development underlying malocclusion.

What, then, is orthodontia? Is it primarily a form of therapy for correcting a physical defect with art dominating the procedure? Or do we accept McCoy's definition that orthodontia is a study of dental and oral development, seeking to determine the factors which control growth processes to the end that a normal functional and anatomic relationship of these parts may be realized, aiming also to learn the influences necessary to maintain such conditions when once established.

This latter conception of orthodontia is sufficiently basic and broad enough to satisfy the most ardent exponent of advanced orthodontia. This is the approach that offers the greatest hope of bridging the gaps and widening the frontiers of knowledge of the subject, for it is a conception that forces a serious consideration of the inherent biologic factors in which are locked up the secrets of cell reactions influencing normal and abnormal growth and development. Already some of these secrets have been forced from a reluctant nature. The field of biochemistry has been particularly fertile. The experiments in nutrition of

the Mellanbys, Howe, and others, have suggested that prevention of a large proportion of cases of defective development and of malocclusion may become a fact.

But this conception of orthodontia invades all the other branches of dentistry. It changes it from a highly specialized technical procedure of a clinical character to a broad scientific problem fundamental to a well rounded out conception of dentistry itself. This naturally involves an entirely different type of teaching of the subject than that now generally in vogue.

There are at least three ways in which orthodontia can be presented to students:

First, as a required undergraduate course.

Second, as an elective course for the undergraduate.

Third, as a graduate course for training specialists and teachers.

Every one will probably agree that orthodontia in some form should be given to the undergraduate dental student as a part of his required work. If the scientific phases of growth and development are included in the science courses, particularly in anatomy, physiology, and biochemistry, orthodontia might then be given largely as a technical clinical course. That this is the best method of teaching it is, of course, a debatable question. Even if the fundamental aspects are given in the science courses, a thorough review of these fundamentals is essential in order to emphasize their importance.

In view of the tremendous frequency of defects of development and the importance of the scientific problems related thereto and to the other branches of dentistry, I am strongly of the opinion that orthodontia should be a major subject in the dental curriculum required of all undergraduates. Unless the dental student is made to realize the importance of this phase of dental practice and is trained adequately to cope with the many conditions leading to malocclusion, there will be no decrease in the appalling prevalence of dental deformities.

From the standpoint of prevention and early recognition of malocclusion, it is not a matter at all for the specialist in orthodontia but is directly a responsibility of the general practitioner of dentistry. Our dental curricula, in my opinion, have been deficient in the attention given orthodontia, and it is time that the error should be corrected.

A course of lectures dealing with problems of diagnosis and treatment of malocclusion is a hopelessly inadequate method of presenting the subject. Lectures supplemented by clinics in which the student either observes the treatment of cases or handles the treatment of cases himself—a method employed for many years at Harvard—is a much better procedure. But in the light of our present knowledge, this too leaves something to be desired. Unless there is a constant emphasis upon the underlying problems of development, unless there is a study of the physical condition of the child—a study of the child as a whole—correlated with his oral condition, we cannot hope for much progress in orthodontia. Any course short of this is vocational training—a technical matter—but is not training in a branch of science. So far as presenting orthodontia as an elective course is concerned, if it is as important as I have attempted to suggest, then the placing of the subject on the list of electives would be unintelligent. On the other hand, elective advanced courses for undergraduates who show especial apti-

tude and interest in orthodontia would be highly desirable, provided the time program of the curriculum permits such a procedure.

Graduate courses in orthodontia of an academic grade equivalent in quality to graduate work in other departments of the university should be available wherever the facilities of the dental school make this possible, for it is in this way that teachers and clinical specialists may be trained and where research will carry forward the torch of new knowledge. Research usually paves the way for advances in the teaching of a subject. So great is the need for fundamental research in the science of orthodontia that every encouragement should be given this part of its development.

It has been strongly urged by a prominent exponent of dentistry that orthodontia be offered in a graduate year and eliminated from the undergraduate curriculum except for a few general lectures outlining the underlying principles. If there is any truth in what has already been said, the fallacy of this program should be obvious. Two especially serious disadvantages may be mentioned. First, this plan creates in the mind of the student the idea that orthodontia is a specialty and, therefore, of little concern; and second, it provides no opportunity for emphasizing, as I am certain should be done, the responsibility of the general dentist in preventing malocclusion. Without this the dentist, frequently in his ignorance, may even do things that will lead to defects in occlusion.

SUMMARY

There is a tremendous prevalence of defects of growth and development of the jaws and teeth. If any progress is to be made in reducing the incidence of these deformities, it must be in large part the responsibility of the general practitioner. This responsibility may be met adequately only when orthodontia is better taught, which necessitates a recognition of the need of improving and extending the teaching of orthodontia. Making it a required major course for undergraduates with opportunity for graduate work, especially in the field of research, will go far toward improving a situation which at present is unsatisfactory.

REFERENCES

Baker, Lawrence W.: Preliminary Study of the Influence of the Forces of Occlusion on the Development of the Bones of the Skull, *Dental Items of Interest*, February, 1911.

Rogers, Alfred P.: Exercises for the Development of the Muscles of the Face, with a View to Increasing Their Functional Activity, *Dental Cosmos*, October, 1918.

Landsberger, Richard: Der Einfluss der Zähne auf die Entwicklung des Schädels, *Arch. f. Anat. u. Physiol.*, pp. 249-258, 1912.

THE TEACHING OF PRACTICAL ORTHODONTIA IN THE UNDERGRADUATE CURRICULUM*

LAWRENCE W. BAKER, D.M.D., BOSTON, MASS.

IT IS a generally acknowledged fact that the teaching of practical orthodontia is one of the major problems of the undergraduate dental curriculum. In America, as no doubt in other parts of the world, there are a wide difference of opinion and much confusion among the orthodontic teachers as to how this most difficult branch of our work should be taught.

As far as I can observe, at least in America, we seem to be divided into two groups, one group maintaining that applied orthodontia should be taught along similar lines to those used in all other branches of practical dentistry—that is, the student should himself do the actual work on the patient under the direction of his clinical instructor. The other group holds the opposite view, insisting that because the undergraduate student is not qualified to attempt this difficult and exacting work, he should not touch a patient, but that his knowledge of clinical orthodontia should be gained by observation.

Personally, I believe there is much to be said on both sides of the question; the opinion of each group of teachers is unconsciously formed by the conditions under which they work—upon their local environment. This local environment, this school environment, is determined very naturally by the standards of the particular school, by the standards of the entrance requirements, the length of the course of study for the degree, and by the size of the classes, all of which determine the “teaching spirit” of that particular school.

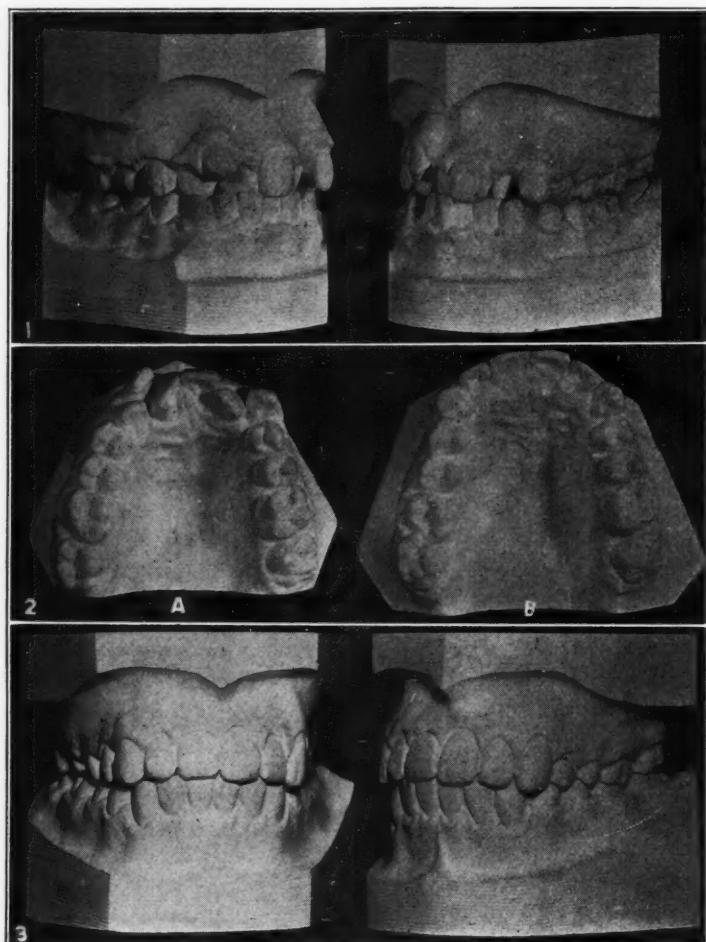
In a school with low entrance requirements, a short course of study for the degree, say three or four years, and large classes comprising from one to two hundred students—too large for group-teaching—it would be an injustice, in my opinion, to both students and patients to allow those students to work on people. They are not prepared to do this difficult work on a human being; their clinical knowledge of orthodontia should be gained by observation.

On the other hand, in those schools where the entrance requirements are high, where the course of study is long, say six years, of which two are for cultural and broadening study, and where the classes are small enough for adequate group teaching, classes of not more than one hundred students, then—although I am aware that many teachers in grade A schools do not share my views—I believe it is safe to put the student in the clinic and allow him to treat cases himself under the guidance of the group teacher. That student has the great advantage of learning through all his senses.

These are exactly the conditions under which we work in the Harvard Dental School, and so we do not hesitate to allow students to treat cases themselves, of course under close supervision. Our environment is right for group teaching; our students learn by doing; they learn with all their senses. This is nature’s way of teaching, and it has never been improved upon.

*Presented before the Second International Orthodontic Congress, London, England, July, 1931.

The spirit of group teaching, instilled into the scientific departments of our University many years ago by the late President Charles W. Eliot and ably carried forward by President A. Lawrence Lowell, has permeated our school to the orthodontia department. This teaching spirit was made clear in an address by President Eliot some thirty or more years ago to our teaching staff and student body. That great educator, in speaking of the mode of instruction in the Harvard Medical and Dental Schools, called particular attention to the fact that ". . . . the proportion between teacher and



Figs. 1, 2, and 3.

student is such that there is one instructor to every two students." Continuing, he said, "this proportion, without exaggeration, is unprecedented. No such relation exists elsewhere in the University or in any other university, and the object of all this is to give individual instruction and to have this instruction presented to the student by skilled experts."

Let me add, before showing you what our students have done and are doing, that I am aware that there are other methods of teaching applied orthodontia in the undergraduate curriculum. Nevertheless, whatever success practical orthodontia has attained in our school and whatever value the clinic possesses

as a charity are due primarily to the principles laid down by that great educator. The following cases are some results of this method of teaching:

CASE 1.—Fig. 1 illustrates a difficult Class I case, one which would test the skill of a most experienced orthodontist.

Figs. 2 B and 3 show the student's result, obtained with the classical expansion arch appliance. Not only did he render a real service to the patient, but he himself received a great deal of educational value. Skilled orthodontists well know the concentration and the delicate control of the many applied



A B FIG. 4



Fig. 5.

forces necessary to bring about such a result. This work is a striking example of what has been said regarding the value of practical orthodontia in training the students' mental faculties. The student learned with all his senses.

CASE 2.—Fig. 4 A shows an unusual type of a Class I case. Observe that the maxillary left central incisor has erupted in complete torsocclusion, the mesial surface presenting itself anteriorly, and the right central incisor is erupting in a precisely similar manner.

In Fig. 4 *B* is shown the result of two years of treatment. Fig. 5 shows the patient as she was twelve years later.

One of the students in working on this case "sensed" the great opportunity which orthodontia offered for service. The appreciation of the patient and

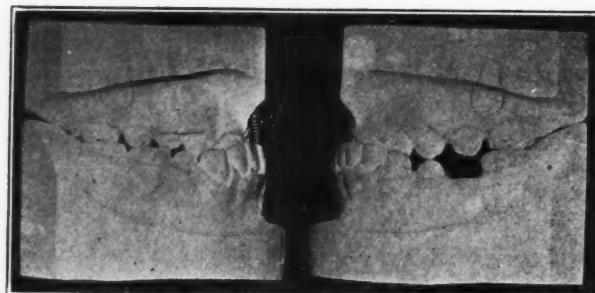


Fig. 6.

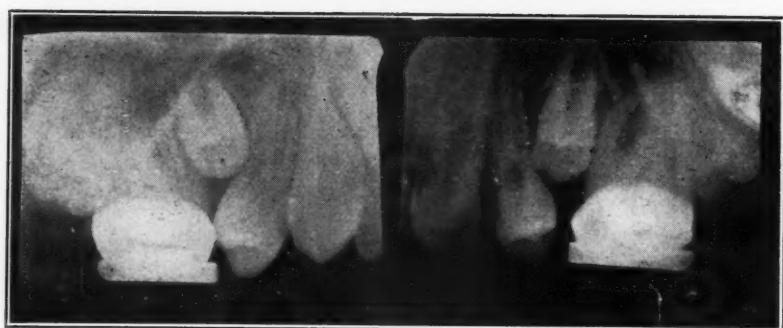


Fig. 7.

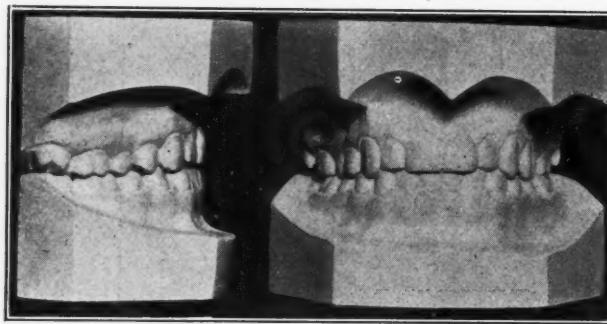


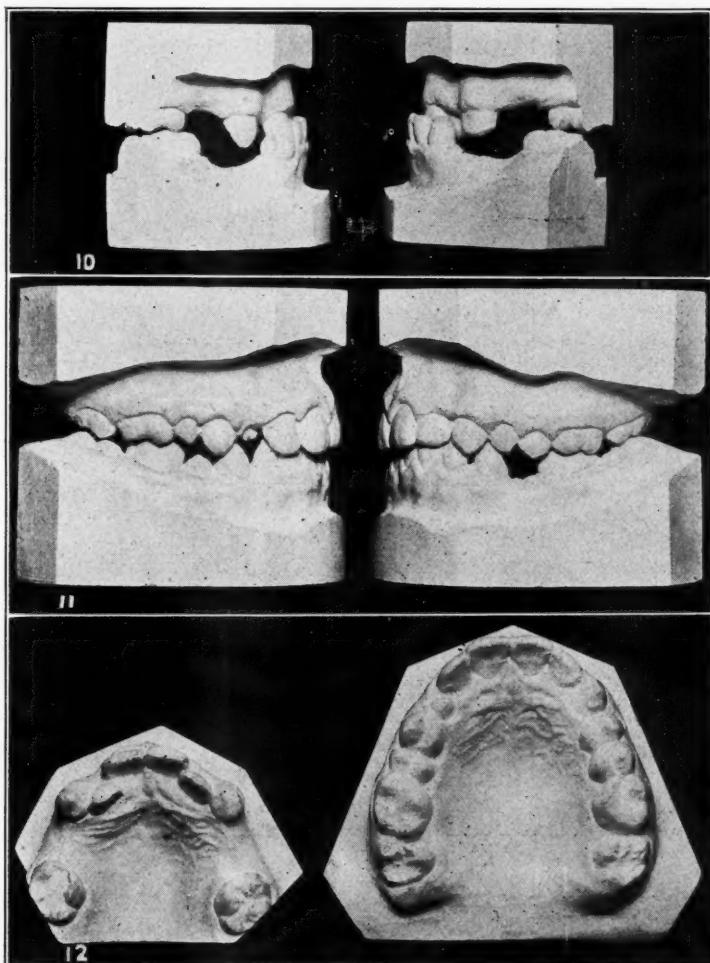
Fig. 8.



Fig. 9.

the gratitude of her mother so stimulated him that he decided then and there to become an orthodontist; he studied further and is now one of us.

CASE 3.—This case, illustrated by Figs. 6, 7, 8, 9, had a similar influence upon another one of our graduates, Dr. Fred R. Blumenthal. In working on this case in his undergraduate course, Dr. Blumenthal became so inspired that he too decided to make orthodontia his life work. He prepared himself for specialization by devoting an entire academic year to postgraduate work with



Figs. 10, 11, and 12.

us studying orthodontia and its closely related subjects. He is now entrusted with the responsibility of our postgraduate teaching of orthodontia, about which he is soon to explain to you.

CASE 4.—This case is presented here because it gave the student a wonderful study in the influence of the occlusal forces. As all know, it was not a difficult case to treat, but the carrying forward of the four malplaced maxillary incisors to their normal position gave the student great insight into the far reaching influences of these powerful forces. Not only have these malocclusal forces brought about a marked arrest in the development of the maxillary dental

arch and maxilla, but these perverted forces also caused an arrest in the development of the internal structures of the face as well.

The actual treatment was accomplished in one school year, all appliances being removed by the last of May. No retaining appliances were necessary, the occlusion forces serving as a retainer.

Fig. 10 shows the condition before treatment, while in Fig. 11 we see the changes six years later.

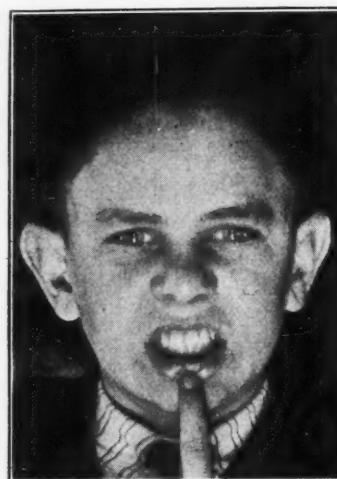


Fig. 13.



Fig. 14.

What a wonderful study this transformation was in the forces of occlusion! The student in converting these malocclusal forces to the normal, with his own hand and brain, could not but "feel" the great power of occlusion and its far reaching influence on the development of the bones of the face.

In Fig. 12 is seen the palatal aspect of the arch before and after treatment. What a study this was in bone development by applied forces! The little boy himself is shown in Fig. 13, no longer a dental cripple.

CASE 5. (Fig. 14.)—This was an unusually interesting case from the teaching standpoint. In the first place the students could plainly see that the impaction of both the maxillary canines caused an arrest in the development of the superior maxillary bones and this skeletal deformity caused a consequent inharmonious development of the facial lines.

In the second place, a certain amount of knowledge of radiography was

necessary for a complete diagnosis. The position of the right canine was easily diagnosed without the aid of the x-ray picture, for the characteristic swelling of the bone showed that it lay palatally to the dental arch, but there was no indication of the presence of the left canine whatsoever, it being so deeply embedded. However, the x-ray picture revealed its presence as shown in Fig. 15 A. The arch was expanded and thus space was made for the missing unit. Later a skiagraph revealed, as we see in Fig. 15 B, that the tooth had righted itself



Fig. 15.

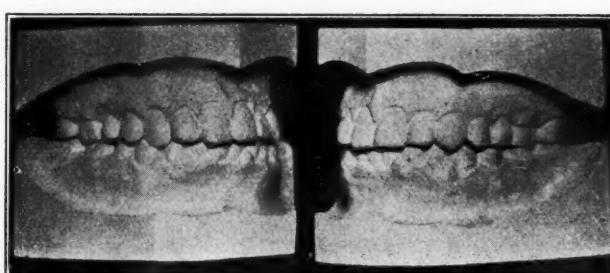
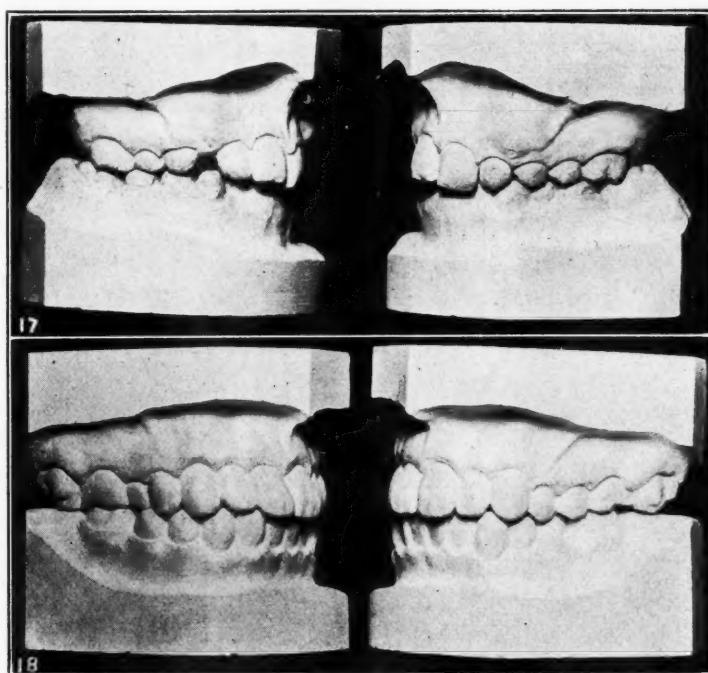


Fig. 16.



Figs. 17 and 18.

and was descending to place. Fig. 16 shows how intelligently the student guided it into correct position. The right aspect of the completed case shows also that this impacted canine has also been successfully brought to proper position.

CASE 6.—Fig 17 illustrates a case complicated by a complete impaction of

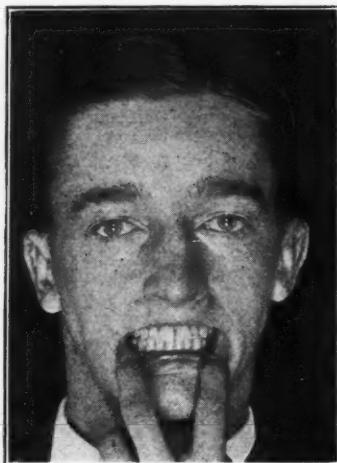
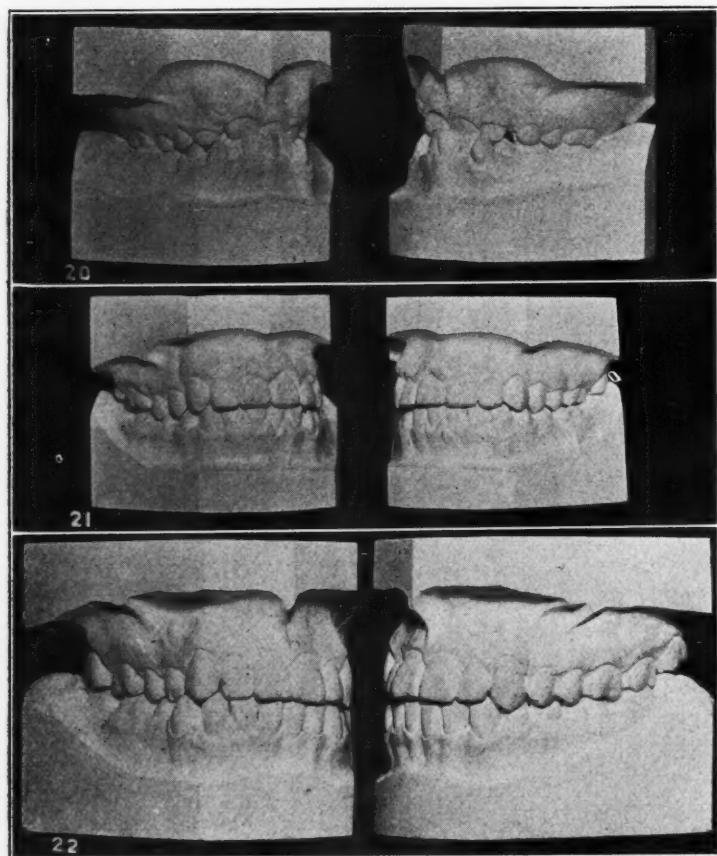


Fig. 19.



Figs. 20, 21, and 22.

the maxillary left canine and a partial impaction of its mate. The case was further complicated by the loss of both mandibular first molars. This patient entered the clinic October, 1917. In Fig. 18 the condition is shown six years after.

Fig. 19 shows the patient himself, years after the removal of all retaining appliances, and one can observe how well the work is holding. He was a fine type of an intelligent boy, in fact he is the son of one of Boston's respected schoolmasters. Working for patients of this type is why the members of the orthodontic staff are so willing to devote much valuable time to the clinic. They know they are giving the students valuable knowledge, and the imparting of this knowledge is a true service to the patients.

CASE 7. (Fig. 20.)—This case was a most interesting study in the forces of occlusion, for the five cardinal principles which accompany normal occlusion were completely overthrown.

The result (Fig. 21 showing two years of treatment and Fig. 22 the conditions fourteen years later) clearly shows the skilled orthodontist that the funda-



Fig. 23.

mental laws of occlusion must have been thoroughly and deeply inculcated into the student's mind, and furthermore that to achieve this truly beautiful piece of work the student must have had indelibly stamped on his mind those five great cardinal principles of normal occlusion. The student well knew that normal occlusion signifies: first, maximum utility; second, that normal occlusion means the establishment of nature's laws of self-cleansing; third, that normal occlusion brings about normal bone growth; fourth, that normal occlusion is accompanied by normal facial lines; and last, but not least, that the establishment of normal occlusion brings about that ever sought equilibrium of the occlusal forces—nature's retainer.

The career of this patient is noteworthy. He was in moderate circumstances; in fact, while attending high school he spent his spare time in an engineer's office as office boy. He decided to become an engineer, so worked his way through the Massachusetts Institute of Technology, where he obtained his master's degree. He then went to South America as an engineer, and helped in the construction of a railroad in the Andes Mountains. When our country entered the war, engineers were needed, so he entered the Navy, and is now an officer with the rank of lieutenant. (Fig. 23.)

How large a part the correction of this deformity by our students has played in the success that this young man has won is hard to estimate, but it is certain that the deformity would have forever barred him from becoming an officer in the United States Navy.

CASE 8.—Fig. 24 *A* is a photograph of a typical sufferer of Class II, Division 1. Note the vacant stare. In Fig. 24 *B* observe the transformation—a

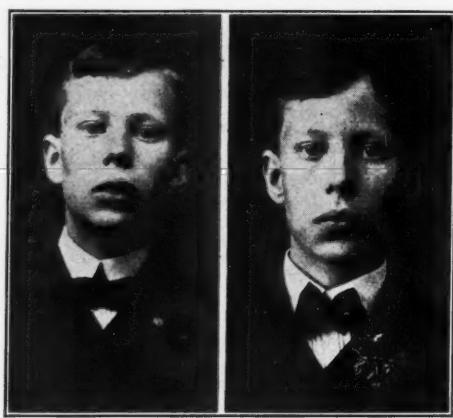


Fig. 24.



Fig. 25.



Fig. 26.



Fig. 27.



Fig. 28.



Fig. 29.

bright, intelligent face. The keen-eyed student noted this change and asked the cause. Those present at this Congress well know the underlying cause—it is normal occlusion. The misplaced mandible has been brought forward to its normal position, there is full power of mastication, there is normal tongue room, there is normal respiration and there are normal facial lines. All this, combined, has given the boy his manly carriage and set-up.

Fig. 25. (CASE 9) illustrates in profile another case similar to the preceding, and again the same transformation is seen.

The last group of cases were treated under the direction of other teachers of clinical orthodontia. Cases 10, 11, and 12 (Figs. 26, 27, 28) were supervised



Fig. 30.

by Dr. Horace L. Howe; Case 13 (Fig. 29) by Dr. Adelbert Fernald, and Case 14 (Fig. 30) by Drs. Fred R. Blumenthal and Shinji Fujishiro.

No thoughtful person can study these illustrations, as well as those of the two preceding cases, without realizing that the correction of these deformities has changed the future of these dental cripples. These deformities are far reaching, they go deeper than mere facial disfigurements, they penetrate even the highest nerve centers, and it is evident that their correction has had a direct and powerful influence in the visible as well as the invisible; in other words, the treatment has brought about not only a physical improvement but also a far reaching psychologic change.

THE PLACE OF GRADUATE ORTHODONTIA IN DENTAL EDUCATION*

FRED R. BLUMENTHAL, D.M.D., BOSTON, MASS.

IT IS not my function to discuss orthodontia as an undergraduate subject; that is Dr. Baker's field. It is my function to discuss orthodontia as a graduate subject and its place in dental education, and thereby show the distinction between orthodontia as an undergraduate subject and orthodontia as a postgraduate subject.

Whereas, orthodontia as an undergraduate subject is taught only as a part of the general understanding of dentistry, orthodontia as a postgraduate subject requires knowledge and expertness in the detection of the causes of maloelusions, the remedies for such defects and the mechanics which may be concerned in it. Further, it is necessary to realize the anatomic and functional limitations of such possibilities. In order to be best prepared a student in such a training must go far beyond his own field and must be familiar with anatomy, embryology, physiology, histology, and pathology of the related structures of the head and face, and also biology in its relation to growth and development. He must be able to resort to practically all the devices and laboratory knowledge that general medicine offers. In order to do this, consultation with various medical specialties which will aid him to gain the broadest possible outlook for the intelligent understanding of the particular problems involved in each case, must be a necessary part of this training.

Gross and microscopic anatomy of the head and neck, including a most thorough study of the muscles of mastication and expression, the study of tooth and jaw relations, and development, beginning with embryology and progressing through comparative anatomy to the evolution of the head is important. For this purpose, the dissection of the normal and the fetal head is a prime requisite.

Coincidentally with this, the twelve cranial nerves and the sympathetic nervous system in their relation to dental structures, and the circulatory relations especially with reference to the venous sinuses of the head, are of vital importance.

The relationship of otology, rhinology, and laryngology: the study of the sutures of the osseous structures of the head and face and maxillary arches, intranasal deformities and facial asymmetries, coincident with teeth and dental irregularities, play their part in the graduate student's introduction to the advanced study of orthodontia.

On outlining such a course of study for the practice of orthodontia as a specialty, the theoretical side on the one hand and the practical side on the other, must be considered concomitantly. So that in the theory and practice of orthodontia, by means of lectures, laboratory work and clinical instruction, emphasis must be placed on the history of orthodontia, the development of

*Paper presented at the Second International Orthodontic Congress, London, 1931.

methods of treatment, the advantages and disadvantages of the various types of mechanical appliances and the use of muscle exercises.

Since we are dealing largely with children, pediatric problems embracing nutritional disturbances and general and oral pathology in the child with special reference to dental problems involved, should be covered by lectures, and such demonstrations as will make clear to the student the necessary relationships.

In the same way child psychology, with special reference to habits affecting malocclusion and problems of handling children as patients, should be a part of the curriculum.

Mouth conditions with related skin lesions, facial lesions which the orthodontist should be able to recognize as a safeguard and preventive measure, and congenital lues with its dental manifestations, make dermatology and syphilology desirable studies.

Pediodontia by clinical observation of preschool children and covering the growth and development of occlusion from infancy to adolescence is of great importance.

Oral and plastic surgery covering the problems of mandibular resections, the removal or exposure of impacted teeth and the conditions associated with cleft palate, harelip, and frenum should be included in the course, as the skilled orthodontist plays an important part and is a direct aid to the surgeon in the successful treatment of many of these cases.

On the practical side, a thorough study of roentgenology and photography is a necessary part of the training, for both are important in the diagnosis and treatment of cases of malocclusion.

Clinical practice, including examination of many patients to determine whether or not orthodontic treatment should be undertaken, diagnosis with the aid of study models, x-ray pictures, and photographs, and the actual practical experience of carrying on several cases of malocclusion by various methods and various orthodontic appliances under the direct supervision of competent instructors, is imperative. The student in a graduate course should be obliged to use his own ingenuity in the latter part of his training in order to show whether he has absorbed the general principles involved. Case teaching has been found to be a most practical method of instruction, and research work involving original investigation should be required in order to stimulate original thought.

The great need today is for scientifically trained men who can better diagnose cases of malocclusion, men who can recognize the early manifestations of variations from the normal which may become serious if neglected and advise and treat them accordingly. Without this skill one cannot effectively undertake measures of prevention. In prevention lies the keynote of all modern dental and medical education. A scientific mechanical training is also necessary in order to allow one to construct the simplest and best appliance which will aid in guiding and restoring normal physiologic growth, the primary function of the orthodontist.

To obtain these requisites, it is essential that we broaden the place of graduate orthodontia in dental education.

DISCUSSION OF PAPERS ON EDUCATION OF DR. NORD, DR. MINER, DR. BAKER, AND DR. BLUMENTHAL

Dr. L. Waugh said that he fully agreed with what Dr. Nord had said. He also liked what Dr. Blumenthal wrote and the papers of Dr. Baker and Dr. Miner. He pointed out that if more of us studied the problem of orthodontia as Dr. Miner had done, it would have found its correct place in the curriculum of orthodontia. He described how, after an experience of some years as a general practitioner who did orthodontia in his practice, but at the same time took science for fourteen years at the university, he became so convinced that the only manner in which he could render orthodontic service to the patients was to withdraw from the faculty and study orthodontics exclusively.

He said they were dividing orthodontia into three phases.

1. Preventive malocclusion.
2. Corrected malocclusion.
3. Past corrected observations.

These three phases embraced all parts of orthodontic training from the beginning of the third, or junior, year to the end of the student's practice, the first two years being devoted to training of fundamental studies as medical students with emphasis on dental subjects.

The students are asked to develop the attitude of conscience, i. e., if they feel that they cannot do the patient any good, they should leave the case alone.

Mr. Pitts, London, said that unfortunately he was not able to hear all the papers, but as a teacher of clinical orthodontia and an examiner he had come to certain conclusions with regard to the place orthodontic education should occupy in the training of the undergraduate.

We must face the fact that in this country (England) orthodontics has not generally been practiced as a specialty. The probability is that we shall see an increase of specialization, but for a very long time to come he thought that the bulk of orthodontic treatment would have to be carried out by the general practitioner. He may acquire more knowledge if he is interested, after he has qualified, but some groundwork must be gained while he is a student. It seemed to him that in the teaching of the student one must bear in mind the necessity of teaching on broad and simple lines. He would feel content if the student qualified in knowing how to carry out the simple forms of treatment. He should know how a removable appliance should be made. He (the speaker) should also expect the student to know sufficient about orthodontic diagnosis to know his limitations. He agreed with Dr. Miner that the really important thing was that the young practitioner should know the cases he ought not to treat. It was very distressing to see children coming along at the age of fourteen or fifteen years with a history that the general practitioner had been deferring treatment because he said the time was not yet ripe. It seemed to him, therefore, that one of the most important things was to teach students how far to go in orthodontic treatment and the cases which should be left alone. The knowledge of orthodontics of an advanced type was essentially a matter for postgraduate instruction, for only by study after qualifications could the dentist hope to acquire any real experience of this branch of dentistry.

Dr. Tansey, Kansas City, said that he had been very much interested in the papers that had been read in regard to orthodontic education as it has been carried on in the United States in the last thirty years, and he noted the alarm of the instructors, or at least of the deans of the dental departments of the various schools and universities about orthodontic education at present. He was in accord with them to some extent. He believed that the definition of orthodontics quoted by Dr. Miner was a little bit extended. Orthodontics dealt largely with the straightening of teeth; of course the dentist was supposed to learn all these other things in his dental course, but he did not think that the deans needed to be alarmed about the present position of orthodontic education, especially after having seen Dr. Baker's slides which show us what beautiful work is being done.

In the past orthodontists who have pioneered in this field and to whom all honor should be given, have gone from the ranks of the general practitioner, and they are men who after treating a few cases of orthodontia have become infatuated with the subject and decided to go into it more extensively until it had become necessary to exclude other practice.

It was his opinion that orthodontic education would have to come largely from the

specialist becoming associated with the younger man who will elect to do orthodontia. He would not be doing his duty if he did not offer an invitation to the dentists and students who come from great institutions in the east to go to Kansas City, where they had been treating postgraduate orthodontia to a large extent. He would ask them to see the work of Dr. Brady, who had been doing postgraduate treatment for thirty years.

Dr. Wright, Boston, said that if a beginning is not made somewhere with the student, no progress would ever be made. If the young prospective surgeon was never allowed to make a dissection, all the theory in the world would amount to very little. If we can plan to give all our dental students this early preliminary training of what is necessary in the simpler cases, then we shall win an interest more frequently in a larger number of students than if we let them elect or not to study orthodontics.

There are more than 2,000 children going through orthodontic treatment in Boston alone every year. If the totals of all the dentists in America are combined, there would not be enough to cope with the dental irregularities. We have got to face this problem from its inception or see literally thousands of malformed men and women as the result of neglect. He therefore made a strong plea for training the dental student by working on a living patient rather than by looking over somebody's shoulder.

Dr. Grieve, Toronto, said that there was one point which Dr. Nord raised, and that was the number of orthodontic failures. The thing he was anxious to drive home was a point which would probably come under the heading of etiology. He was convinced that teeth do not occupy positions distal to normal in relation to the apical base. So much has been done by means of the lingual arch and springs in the way of expansion in order to obtain growth in the dental base. But if the theory which he had presented and which had been so clearly expressed by Dr. Sim Wallace was correct, then in his opinion the result of the failures had been due to the fact that we had been endeavoring to enlarge that apical base. In his opinion we must not carry teeth forward on the apical base. We must carry them back, for the malocclusion to his mind was a forward displacement of the teeth. The point he wished to make was that our teaching had been wrong and that students must be taught this.

Dr. Miner in reply said that he was not in the least concerned about the treatment of malocclusion. He thought it was perfectly safe in the hands of the men in the east and west, but there was a point that Dr. Tansey had overlooked and that is that there had been no progress made whatever in the control of malocclusion. We are having as many cases today and more than we had thirty years ago. There had been no prevention at all and that is what concerned him. This was just as frequent in the middle west as on the eastern coast. The only way we could hope to improve matters was to impress on the student the importance of the whole matter and how to recognize malocclusion and how to treat it.

Dr. Baker said in reply that he was much pleased with the sympathetic attention given to this group of papers on orthodontic education and that the broad discussion which followed was to him a most hopeful sign. He felt that all this indicated that they realized, as did the speakers, that the future of orthodontia is going to depend, in no small degree, upon the training of those who are going to enter their ranks—the future of this work depends a great deal upon education.

He was also pleased to note that they all agreed that the biologic aspect of orthodontia is fully as important as the mechanical principles and so if the work is to progress along broad lines these mechanical principles must be applied in accordance to biologic laws, and in turn these biologic laws must be applied according to mechanical principles. In other words, orthodontia should be taught as a mechanico-biological subject.

He said in conclusion that he regarded it a great privilege to be here and mingle with his co-workers from all parts of the world and he was particularly pleased to find that so many shared his views about orthodontic education.

Dr. Nord in reply said that the reason he had such a large percentage of failures was that the problem was attacked solely as a mechanical one instead of a biologic one.

In closing the session Mr. Northeroof, who presided, said that he thought the subject a very important one and that the schools ought to decide exactly what was best for the public first, then for the student and after that for the university which was responsible for the teaching.

ULTIMATE RESULTS OF ORTHODONTIC TREATMENT*

B. FRANK GRAY, D.D.S., SAN FRANCISCO, CALIF.

THE following brief survey of a dozen average cases from my practice is made with a view to noting just what may have been accomplished in the way of permanent results.

The orthodontist is usually highly elated over the beautiful results to be noted at the so-called "retention period" or at the time all appliances of whatever character are discarded, yet experience leads him to be more and more

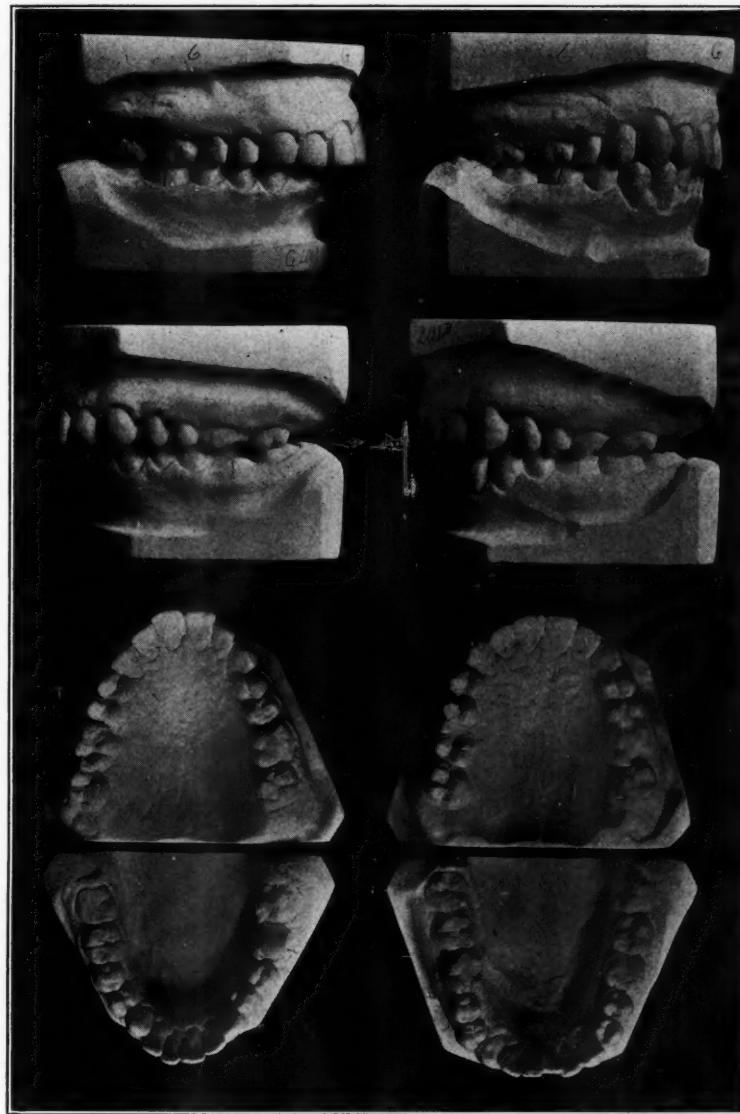


Fig. 1.

*A paper presented at the Second International Orthodontic Congress, London, 1931.

guarded in his prognosis when observing patients at this period. It has been found that however accurately he has been able to work out his ideal for the case, certain unsuspected and little understood influences may ultimately assert themselves more or less to the detriment of the ideal he has so valiantly striven to produce.

If the denture were composed of just so many mechanical units set in a



Fig. 2.

matrix which following orthodontic treatment might become merely so much unyielding material, we might expect that the mutations of time and circumstance need scarcely be reckoned with. But when we deal with the human denture, we have to remember that our problem is one involving the complex life processes of the individual. The mechanics of orthodontia serve us well in so far as we properly interpret all of the forces of the individual organism as they affect the mouth and teeth and are able to bring the various units of the denture into harmony therewith. If these forces be perverted, then the specialist presumably sets himself the far from simple task of correcting them.

The wonder is that some orthodontists seem willing to set forth with so much assurance the simple formula: "Diagnose the case correctly, remove the cause, and your work will surely have a successful outcome." Now, experienced orthodontists have found that frequently the causes of maloclusion are most elusive, and in many instances it is seriously doubted if present-day knowledge permits of any ready and satisfactory solution of these problems.

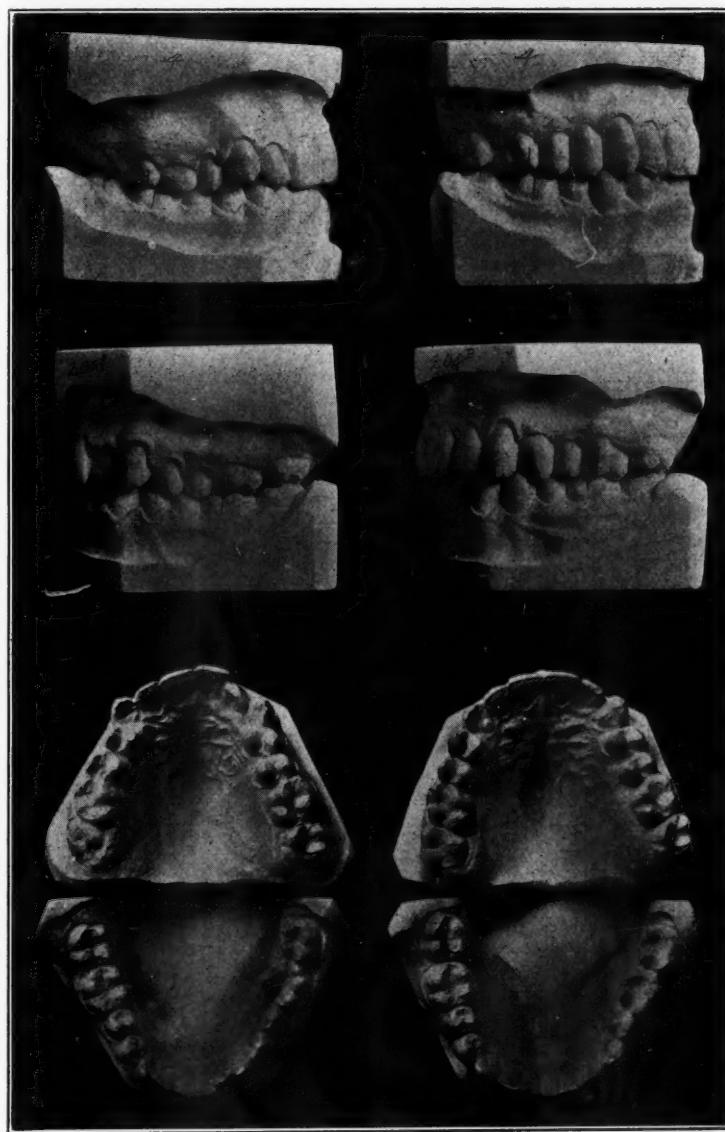


Fig. 3.

In these illustrations, the left tier of models in each figure represents the case at the commencement of treatment; the right tier shows its status in from one to seven years (as the case may be) after discarding all mechanical appliances of whatever kind. I may say that however far short of the ideal I have come there is still considerable cause for gratification in the ultimate results attained.

Fig. 1. Patient aged fifteen years. Note the rather typical Class II, Div. 1 (Angle) type of case. Much facial deformity was in evidence. Not only did the correction result in a well occluding denture but the facial improvement was eminently satisfactory. No appliances have been in the mouth for a period of six years.



Fig. 4.

Fig. 2. Patient aged fourteen years. Class II, Div. 2 (Angle). A gratifying permanent result was attained in this case. The maxillary lateral incisors were badly rotated, and the dental arches much narrowed. So well has this case resulted that the work continues to be a source of satisfaction to all concerned. Seven years have elapsed since any form of appliance has been used in the mouth.

Fig. 3. Patient aged fifteen years. This case was characterized by a deep overbite and narrowness in the canine region. Increased vertical development in the molar and premolar region was secured. The teeth have remained in splendid relation. No appliance has been used for a period of four years.

Fig. 4. Patient aged six years. Much narrowness of both maxillary and

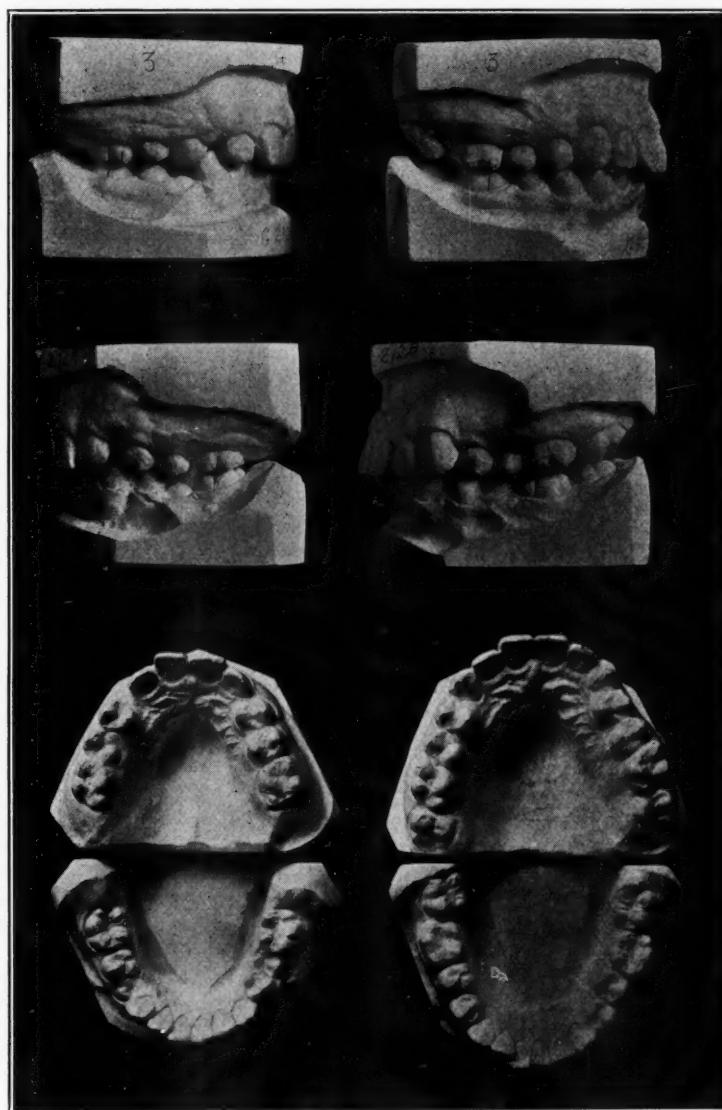


Fig. 5.

mandibular arches was in evidence. After a protracted absence abroad the patient presented with the unhappy disarrangement of the maxillary third molars as noted. Whether the orthodontic procedure should be charged with these discrepancies or whether the impactions were due to conditions inherent in the jaws themselves may be cause for question. This latter thought is suggested because of the many difficulties attending the treatment, the reluctance with which

the tissues responded to arch development, etc. No appliances have been used for a period of three years. The teeth, with exceptions noted, are in fairly good relation.

Fig. 5. Patient aged eleven years. After the manner of the Angle classification one might be tempted to think this a Class II, Div. 2 case. However,

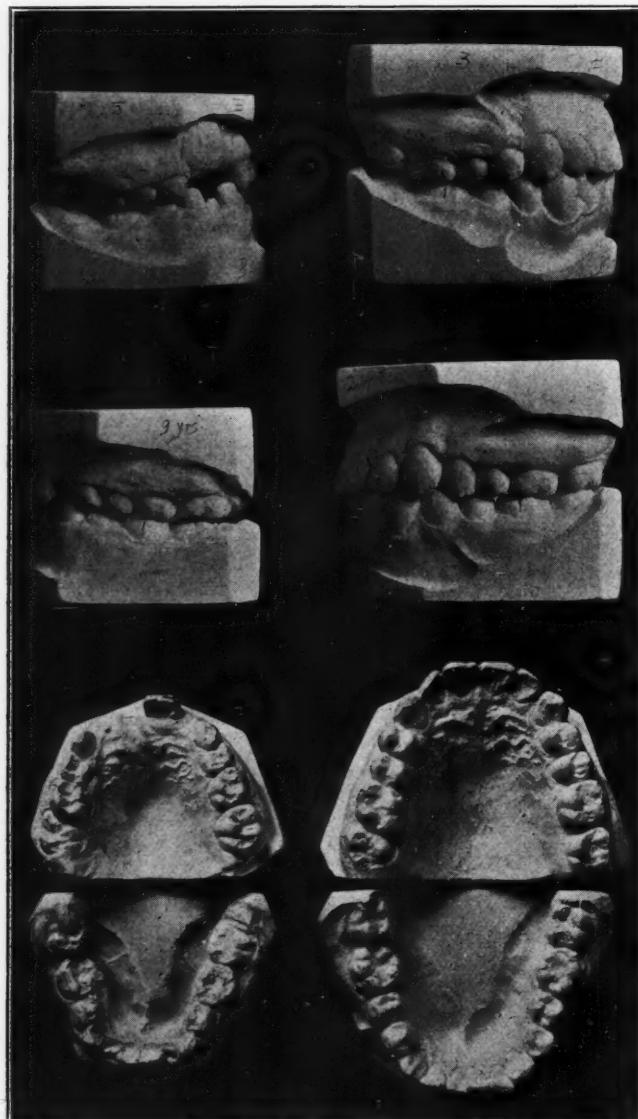


Fig. 6.

having in mind the closing up of the spaces required by the maxillary canine teeth, it is easy to believe the maxillary molars and premolars have drifted forward considerably. Note the shortness of the mandibular arch, with the consequent impaction of the second premolars. The vertical overbite was exaggerated. An unfortunate occurrence in this case was the eruption of the mandibular second permanent molars into positions lingual to the lingual cusps of the cor-

responding maxillary teeth. This is not so apparent from the models as the facts warrant. The condition has been corrected since these models were prepared. All too often the orthodontist is confronted with the tendency of the second molars to erupt into positions of maloclusion. Frequently the case is pronounced completed previous to the eruption of these teeth, and unless the

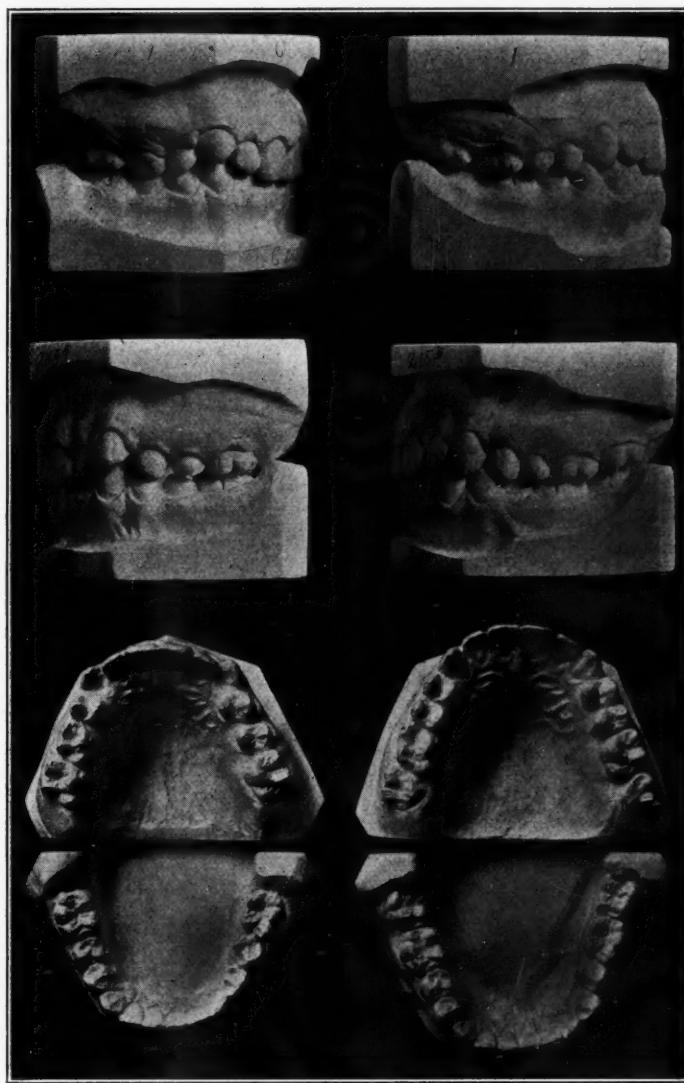


Fig. 7.

patient is under close observation at the critical time there may develop a malocclusion requiring considerable further effort to correct. No appliances have been used in this case for a period of three years.

Fig. 6. Patient aged nine years. This case was characterized at the outset chiefly by the persistent impaction of the maxillary right central and lateral incisors. After releasing the impacted teeth through surgical aid, the central incisor was banded and moved down to place. Though many vicissitudes at-

tended the case at a later period, a splendid ultimate result was attained. Three years have elapsed since appliances of any kind were used.

Fig. 7. Patient aged twelve years. The chief disarrangement will be noted in the imperfect relation in the premolar region; also a very deep overbite was in evidence. The latter feature was measurably improved so that today the

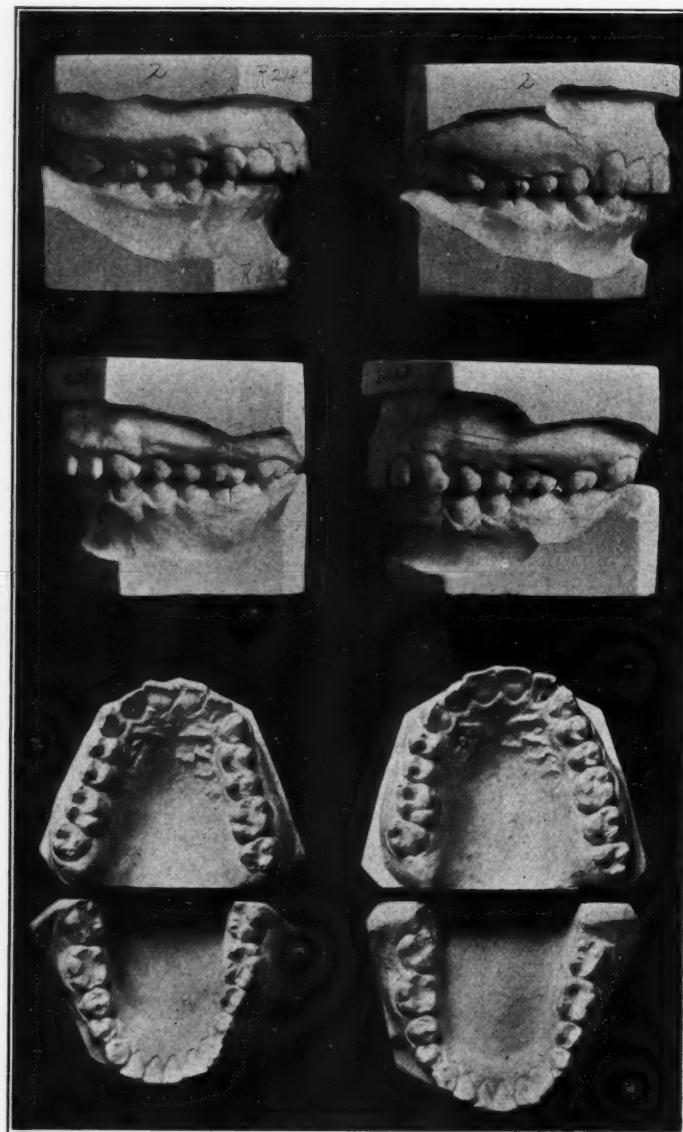


Fig. 8.

case presents a very satisfactory result. The wearing of a maxillary retaining plate was discontinued a year and a half ago.

Fig. 8. Patient aged thirteen years. Note bilateral distal relation of the mandibular arch to the maxillary arch. Both arches were considerably narrowed. In the final models the mesiodistal relation is still somewhat imperfect; however, there is every reason to believe the present arrangement is permanent.

Facial development and symmetry are entirely pleasing. No appliances have been used for two years.

Fig. 9. Patient aged ten and one-half years. The mandibular arch is bilaterally distal to teeth of the maxillary arch. Note the impaction of maxillary right second premolar; also the excessive vertical overbite. Incidentally,

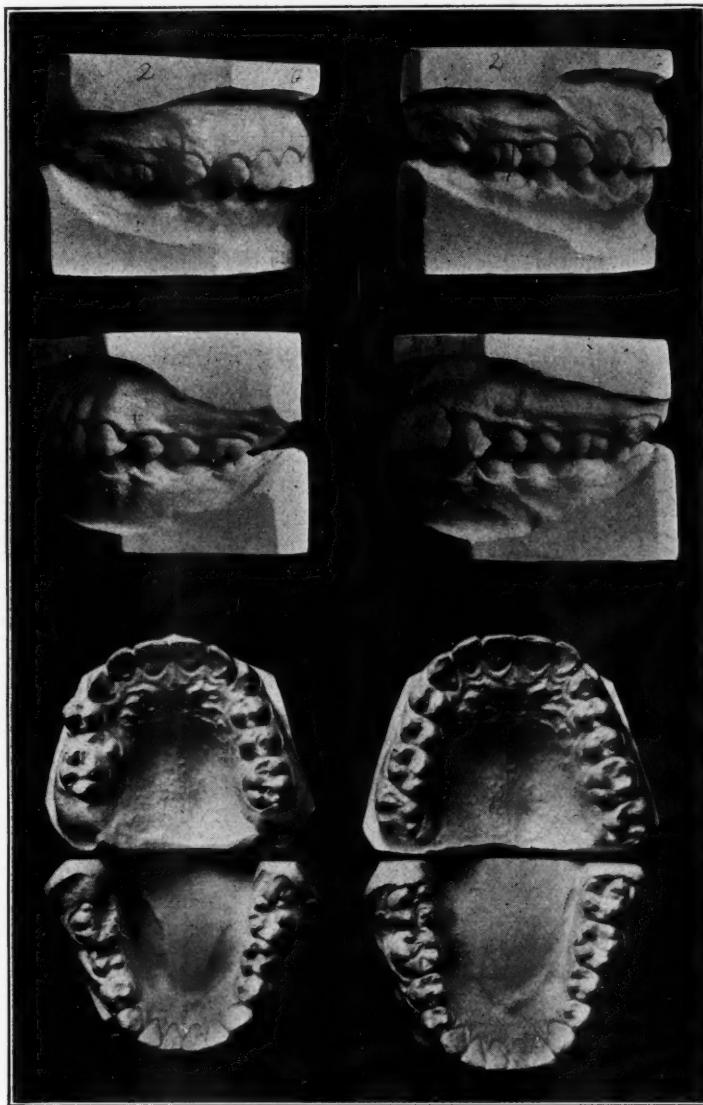


Fig. 9

the maxillary second permanent molars stole a march on us, as in Fig. 5, and erupted in positions buccal to normal. We shall do well to keep a close observation of cases during the eruption of the second permanent molar teeth. The responsibility of the orthodontist cannot be said to end in any case until all teeth, possibly excluding the third molars, have come to proper positions. Excepting discrepancies noted, the case presents a splendid result. Two years have elapsed since any appliance was used.

Fig. 10. Patient aged twenty-one years. This case presents an extreme condition of malocclusion. The orthodontist's own consent to the large amount of tooth movement necessary to conservative treatment was not readily gained. Considering the age of the patient, with the likelihood that retaining splints may need to be worn indefinitely, it is a question whether a like decision would

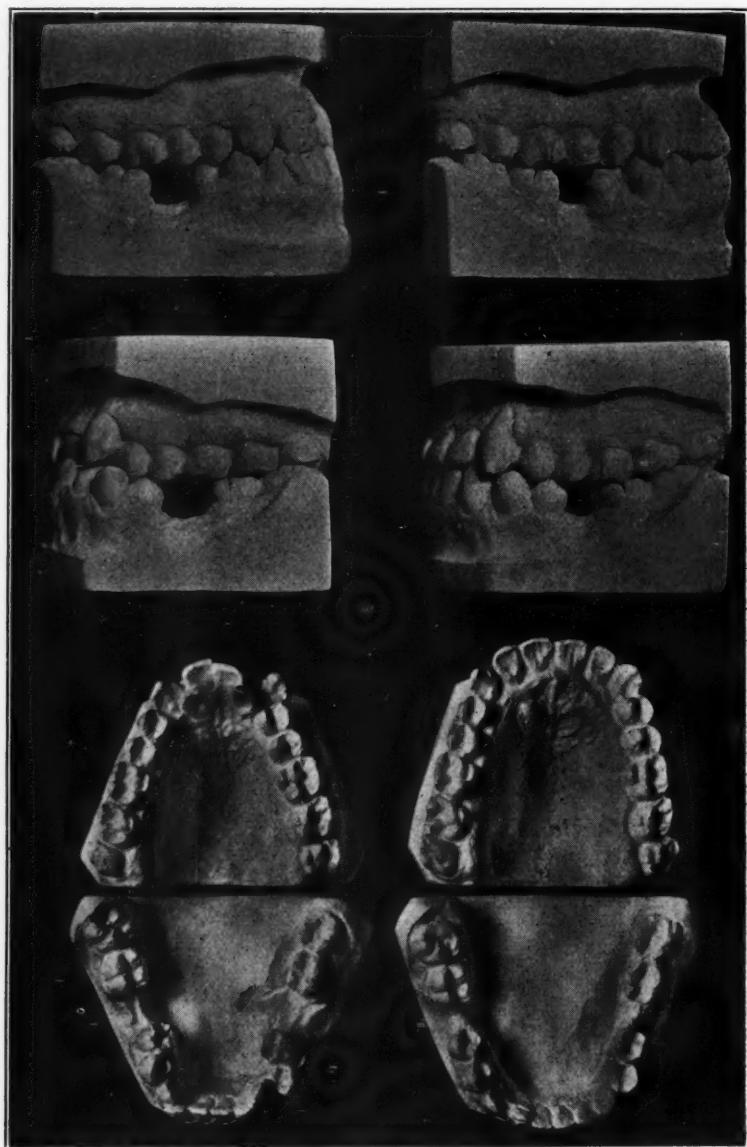


Fig. 10.

again be made in any similar case. The large gain in arch width is obvious. The missing mandibular first molars have been replaced with bridgework since the last models were made. Contrary to the other cases reported in this series, vulcanite retaining splints are still worn several nights each week. In spite of the shortcomings of such a regime the patient is delighted with the results of the

work accomplished. And after all, other things being equal, the gratification of the patient may be the final appraisal of one's results.

Fig. 11. Patient aged thirteen years. Main characteristics of malocclusion: bilateral distal tendency of mandibular teeth in their relation to teeth of the maxillary arch; narrowness of arches; lack of vertical development in molar

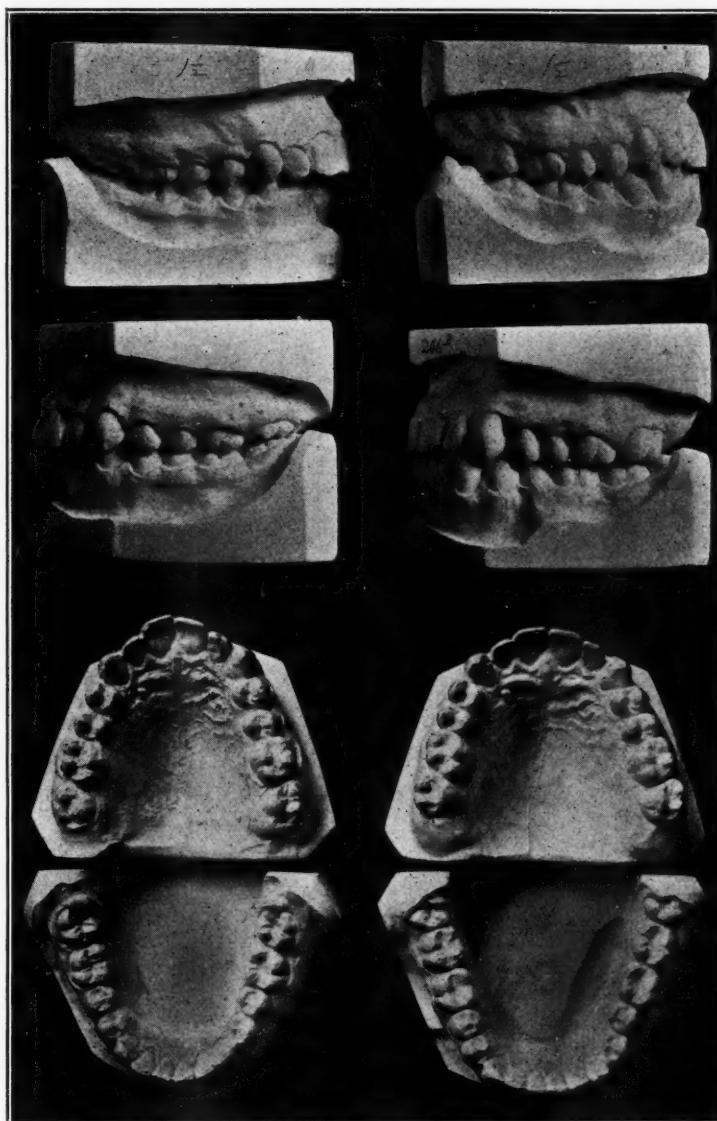


Fig. 11.

and premolar region with protrusion of maxillary incisors. This case has been as gratifying in its results as any one of its type in my practice. The patient is pleased beyond measure at the outcome of his orthodontic experience. No appliances have been used for a period of two years.

Fig. 12. Patient aged twenty years. This young man had an unbounded sense of appreciation of the importance of good, harmoniously arranged teeth.

The mandibular right first molar, defective from the start, was finally replaced with bridgework. No appliance of any kind has been in use for a period of four years.

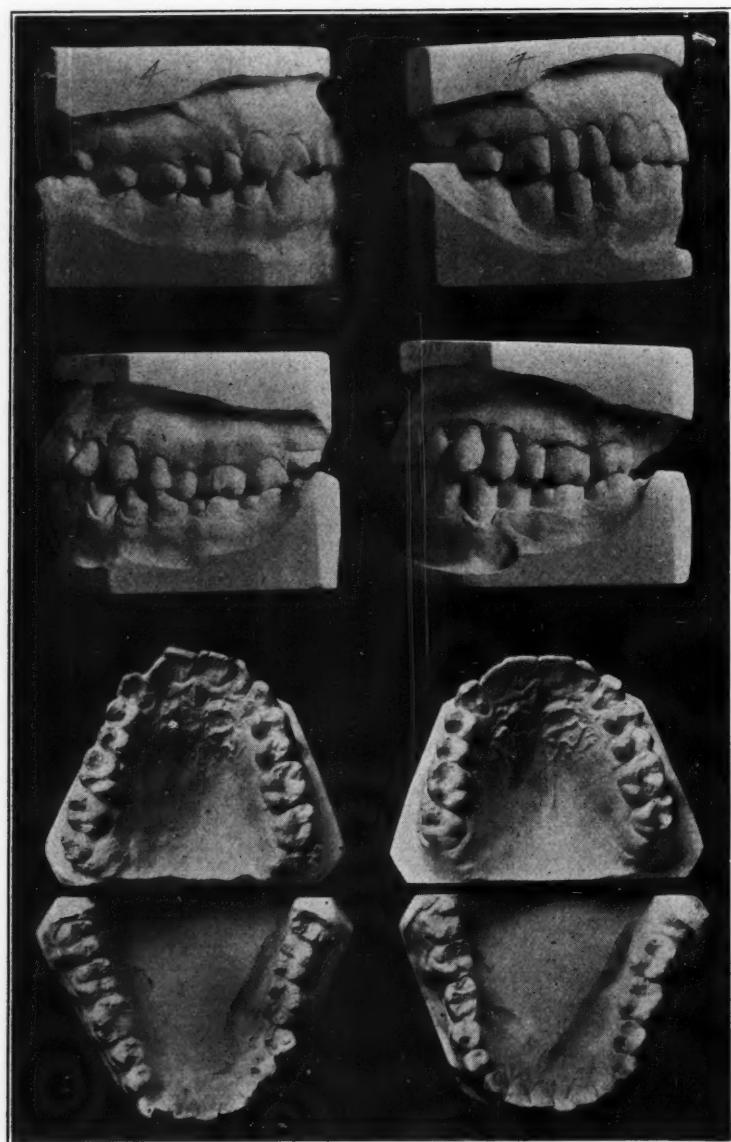


Fig. 12.

ORTHODONTICS. EXTRACTION AS A PART OF TREATMENT*

HAROLD CHAPMAN, L.D.S., ENG., LONDON, ENGLAND

THE THEORY OF NONEXTRACTION

THE teaching of the late Edward H. Angle has had a profound effect on the practice of orthodontics: that a permanent tooth should not be removed as a part of the treatment of an orthodontic case was an axiom of his and is referred to in this paper as "the theory of nonextraction" or simply as "nonextraction." Angle's students† were so greatly influenced by him that it is rare to find, in the writings of any of them, advocacy of extraction; some are as opposed to extraction as Angle himself was and place the subject beyond discussion; others are known to favor extraction in certain circumstances though public pronouncements to this effect are rare; very few have written in support of extraction as a part of treatment. Nonextraction has been so vigorously expounded in the United States that it is accepted by a large public.

THEORIES TOO READILY ACCEPTED AS AXIOMS TO GUIDE PRACTICE

Orthodontics is beset with theoretical dicta, which have no scientific basis but have been accepted as guides to practice; nonextraction is one of them. These dicta or theories may be very estimable as such, but they must not be accepted without qualification. They do not necessarily provide the best solution of the problem with which the public and the profession are faced; this problem is to give the patients a reasonably good, esthetic and functional set of teeth with the least amount of tooth movement; nonextraction is not a universal answer to the problem any more than extraction is. Guides to practice should be sought in the treated cases, unsuccessful as well as successful, of those who have been practicing orthodontics for at least a generation: an ounce of practice is worth a pound of theory.

The theory of nonextraction has little or no scientific basis; it considers the teeth alone and ignores the ground in which they are set, but there are strong common sense reasons for extraction. The truth is that both methods have their place in practice, but the truth has been obscured: obscured in regard to nonextraction, because the development and perfection of appliances proceeded coincidently with the theory of nonextraction and enabled the teeth to be placed in so-called normal occlusion and in regard to extraction because it has not received the careful consideration which it merits; it also has suffered from "theories."

The nonextraction theory presupposes that: (1) normal occlusion, plus normal facial development, results from treatment; (2) the teeth remain in their new positions after a reasonable length of time (say three years' treatment in all). The attainment of these objects is by no means assured.

*A paper presented at the Second International Orthodontic Congress, London, July, 1931.
†Students here refers to those who were taught by Angle himself, in the school which he conducted for a number of years.

The value of a method of treatment is judged by the percentage of cases treated successfully; the criterion of success is not the placing of the teeth in so-called normal occlusion but their retention in those positions without artificial aid. The lesson to be learned from the unsuccessful cases is to avoid similar failures in the future: have the failures any common factor or factors which will enable the orthodontist to say before he starts treatment that a particular case is unsuited to a particular method of treatment? Figures have not been published to show how successful any particular method of treatment in a given case has been. Treatment by nonextraction of Class I cases has probably given the most disappointing results; treatment of Class II and Class III cases by nonextraction, but carried out efficiently at the proper age, has given very good results. The writer suggests as a reason that it is because the treatment of Class I cases involves enlargement of the maxillae (i. e. increasing the amount of bone) but the main treatment of Class II and Class III cases involves a change in the position of the mandible in relation to the maxilla (i. e. probably effects some change in the condylar region or other area of the mandible). In Class I cases there is marked deficiency of bone; in Class II and Class III cases there may be little bone deficiency (particularly in the maxilla in Class II Division 1 cases and in the mandible in Class III cases). The deduction to be drawn is that the prognosis is better when the position of the mandible has to be changed than when the amount of bone has to be increased; the former is probably a true orthopedic operation and the latter an orthodontic orthopedic operation. The writer has no doubt that quite different changes are involved in the two operations.

OBJECT OF THIS PAPER TO OFFER GUIDANCE IN REGARD TO EXTRACTION

Practitioners may be divided into (1) those who favor the principle of Angle (the production of normal occlusion in all cases) and do not admit extraction as part of treatment, and (2) those who favor extraction when they believe it to be the best treatment in any particular case. The arguments for the latter are well put in a paper by J. H. Badecock¹ read at the First International Orthodontic Congress.

The writer believes that neither side has presented its case to the profession as fully as is desirable. The value of a theory depends upon the absence of failure when the theory is put into practice; and as reluctance to publish failures is natural, the tendency of both sides has been to publish only successes, whereas these are of little value unless the failures are also published.

There is no doubt that there have been numerous failures or partial failures with both types of treatment; and for that reason one of the most pressing duties of the orthodontic profession is to formulate rules for treatment, e. g., to say in what cases extraction is, or is not, desirable as a part of treatment. The writer has no doubt in his mind that both types of cases exist. There is another type of case to be considered, that in which treatment is contraindicated unless specially demanded by the patient for particular reasons, and to these the disadvantages of orthodontic treatment should be explained before it is undertaken so that he may decide whether the game is worth the candle. Many of the dental profession have such a high opinion of the benefits of orthodontic treatment that the disadvantages of it are liable to be overlooked; an extreme nicety of judgment is

necessary to hold the balance between the two (the advantages and disadvantages), and where there is any doubt the casting vote should be with the disadvantages. The object of this paper is to suggest principles or rules regarding extraction as a part of orthodontic treatment and to stress the importance of publishing reports of cases treated successfully and unsuccessfully with and without extraction.

REASONS WHY THE THEORY OF NONEXTRACTION IS NOT TENABLE

The retention of every tooth in every case may be considered from three aspects (it is assumed that treatment in which all the teeth are retained requires more time, in regard to both the operator's time and the duration of treatment, than if extraction were a part of the treatment): (1) the scientific aspect; (2) the aspect of general dentistry; (3) the economic or social aspect.

(1) *The Scientific Aspect.*—No generally acceptable scientific reasons have been advanced for the retention of every tooth in every case. It is suggested that since nature provided thirty-two teeth they should be kept at all costs. Nature has not provided room for them; there is a discrepancy between the size of the jaws and that of the teeth; either the jaws are too small or the teeth are too large (it might be a combination of these). The nonextractionists say that the error lies in the jaws and that such errors can be corrected by stimulating bone growth with suitable appliances. But is it not as legitimate to say that the jaws are the correct size and the teeth too large? In fact, this is the more reasonable assumption because the teeth are but the appendages of the jaws and therefore the less important; jaws without teeth are very useful members, but this is not true of the reverse condition. Sir Frank Colyer³ is of the opinion that the jaws are shortening more rapidly than the teeth are becoming smaller. If there is any truth in such a belief, obviously treatment should be to reduce the number of teeth to compensate for the smaller jaws. Also it is doubtful whether bone growth can be brought about by appliances to the extent that perusal of the literature suggests.

The argument may be developed further by considering a typical Class I (Angle) case (Fig. 1). The arches are not large enough to contain the teeth in normal occlusion. The writer's conception of the pathological anatomy of such a case is that the teeth are the visible expression that the maxillary bones and the bones articulating with them are too small, in fact, the area, called by Keith and Campion⁷ the masticatory face (Fig. 2), is too small compared with the teeth. This area includes the bones below the glabella and in front of the external auditory meatus. This large bony area is insufficiently developed to accommodate the teeth in the arrangement known as normal occlusion. The classical treatment of such a case is to enlarge the dental arches so that they will accommodate the teeth correctly. This presents no difficulty; it results from changes which are not understood and for want of a more suitable phrase may be expressed as a "stretching of the bone" containing the teeth. When it has been accomplished, the teeth must be held in their new positions, otherwise they would relapse toward their original places. If there were bone growth, retention should be unnecessary or less uncertain than experience shows it to be. It may be true that bone beyond the teeth, and perhaps as far as the limits of the masticatory

face, is affected by the treatment, but the farther one gets from the teeth, which are the area of the operation, the less "stretching" effect there will be, and what there is will be more difficult to retain.

The conclusion to be drawn is that there must be considerable doubt whether there is any permanent bone growth of the entire masticatory face as a result of

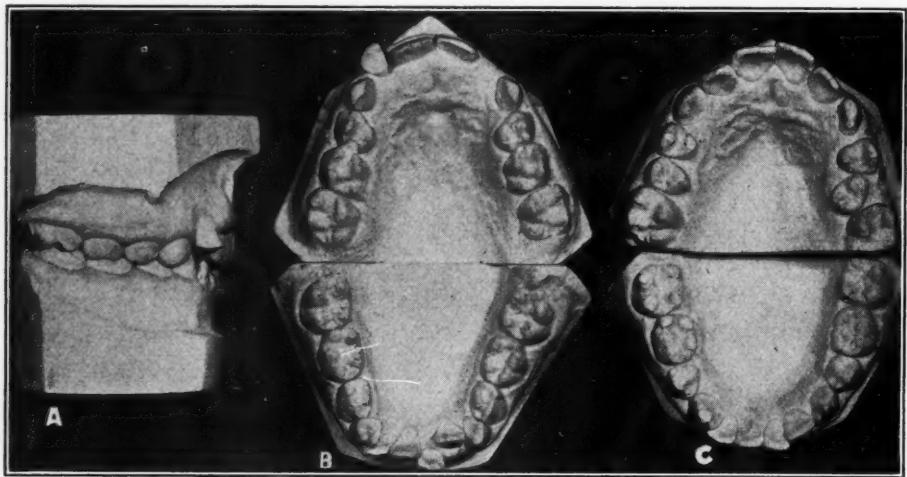


Fig. 1.—Patient aged eight years. A, Right side in occlusion; B, occlusal view. Class I, not severe. Teeth in alignment after one year's treatment and then retained for two years by means of a fixed mandibular appliance only. C, Occlusal view when patient was eleven years, six months old. Four months after the removal of the mandibular retainer half the expansion had relapsed; the alignment of the maxillary teeth remains good; the mandibular incisors are crowded. A removable mandibular retention plate was inserted at this stage to prevent further relapse.

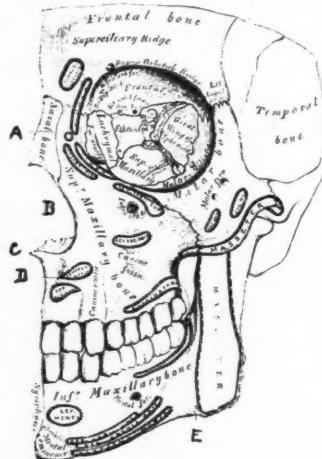


Fig. 2.—The area comprised in the masticatory face of Keith and Campion. A, Tendo oculi; B, anterior nares; C, anterior nasal spine; D, incisive fossa; E, groove for facial artery. (From Gray's Anatomy. Permission of Messrs. Longmans, Green & Co.)

moving teeth; it is more probable of the maxillae alone (than of the masticatory face) but to retain even them in their stretched condition (the bone change is expressed thus because it is doubtful whether any orthodontic appliance causes bone to grow) requires considerable time. After a prolonged period of retention more or less relapse frequently, perhaps usually, occurs (Fig. 1).

If the hypothesis that the masticatory face is too small is correct, its use in

diagnosing abnormalities of occlusion is likely to lead to error, because an abnormal area is used to diagnose abnormalities of position of some of the contents (i. e. the teeth) of that area.

A small amount of experience is sufficient to discover that the crux of orthodontic treatment is not to move teeth but to make them stay in their new positions. How much more difficult must it be to maintain changes in an area like the masticatory face which is to a large extent beyond the orthodontist's actual field of operation. In many cases retention is less difficult when extraction has played a part in the treatment.

(2) *The Aspect of General Dentistry.*—Every practitioner of general dentistry would endorse the view that the wearing of apparatus, were it ever so well made, must be detrimental to the dental tissues, both hard and soft; the longer they are worn and the older the patient, the more detrimental they will be.⁴ If the wearing of apparatus can be eliminated or reduced by a particular method of treatment, then that is the more desirable course even if it does involve the sacrifice of one or more teeth.

(3) *The Social or Economic Aspect.*—At present there are not sufficient orthodontists and dentists to give all the orthodontic service that is required (even if extractions were included as the most desirable method of treating suitable cases). If there were sufficient practitioners and the retention of all the teeth were the best treatment in all cases, it would not be a practicable policy in regard to either time or cost.

This section of the paper may be summarized by saying that neither the scientific, dental nor social aspects of the problem warrant the view that the retention of all the teeth is necessarily the best treatment in all orthodontic cases, and the consideration of all three together negatives that view.

GENERAL PRINCIPLES OF ORTHODONTIC TREATMENT

The following general principles of orthodontic treatment may be stated:

1. The less time appliances are used, the better.
2. A result obtained without the use of appliances is preferable to one obtained with appliances.
3. The advantages of the treatment should outweigh the disadvantages.

RULES FOR TREATMENT BY NONEXTRACTION

Therefore the theory of nonextraction, when it becomes a rule on which to base treatment, needs considerable qualification by further rules, the observance of which is of as great or greater importance than that of retention of all the teeth. The more important of these rules may be enumerated as follows:

1. Tooth movement should not take more than eighteen months (preferably twelve).
2. Tooth movement and retention should not take more than four years (preferably three). If treatment is begun when the patient is four years of age, the total time that appliances are worn should not exceed four years.
3. Treatment should be completed when the patient is twelve years of age (preferably a year or more younger). When treatment will extend beyond the age of twelve years, its disadvantages should be emphasized.

These principles and rules involve the consideration of many factors² which include: age, esthetics, occlusion, condition of the teeth and gums, premature loss of teeth, teeth in abnormal positions, teeth of abnormal form including dilaceration, absence of permanent teeth, supernumerary teeth, delayed eruption of teeth, etiology, mouth-breathing, duration of treatment and number of visits, amenability of patient and parents, general health and physique of the patient, retention and prognosis.

PRINCIPLES OF EXTRACTION

General

Extraction is indicated if it will allow appliances to be dispensed with, or the amount they are worn to be considerably reduced. Expansion is rarely necessary when extraction is employed.

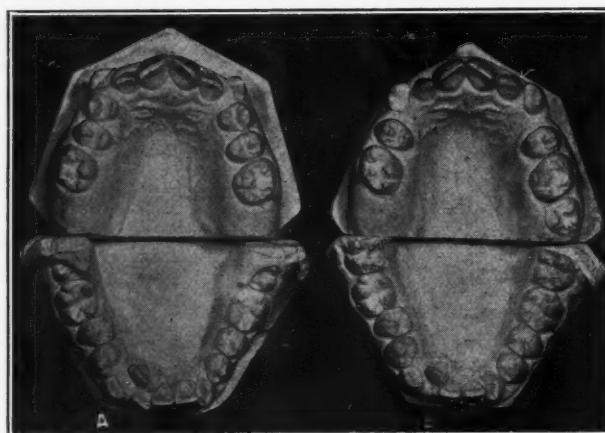


Fig. 3.—*A*, Occlusal view, patient aged ten years, eleven months. Class II, Division 2 malocclusion, $4 \frac{1}{4}$ extracted. *B*, Occlusal view, patient eleven years, eleven months old. Occlusion as in *A*, except that the maxillary molars and premolars have moved a trifle forward and the canines have moved distally; the cheek teeth and mandibular canines have contracted so that $2 \frac{1}{2}$ is shut out of the arch; it has moved forward a trifle. (Bennett, *The Science and Practice of Dental Surgery*, permission of Oxford Medical Publications.)

The mandibular arch tends to maintain the size of the maxillary arch, so the extraction of a mandibular tooth or teeth particularly incisors, is frequently contraindicated (even though extraction is performed in the maxilla), because it is liable to be followed by undue contraction of that arch (Figs. 3 and 11); therefore, considerable discretion must be used in removing a mandibular tooth.

The maintenance of the center line has not the importance that is often given to it (Fig. 4). Similarly, the juxtaposition of a maxillary central and canine is not necessarily contraindicated (Fig. 5). Any treatment is a compromise with perfection, and the less disadvantageous treatment should be chosen; e. g., absolute symmetry by maintenance of the center line involving the loss of a second tooth, or treatment to keep a lateral between a central and canine may be more disadvantageous than the error of the center line or the loss of the lateral. (The writer is opposed to symmetrical extraction as a principle.)

The first premolars are, as a general rule, the best teeth to remove. If the maxilla or mandible is divided into two halves, the first premolar is approxi-

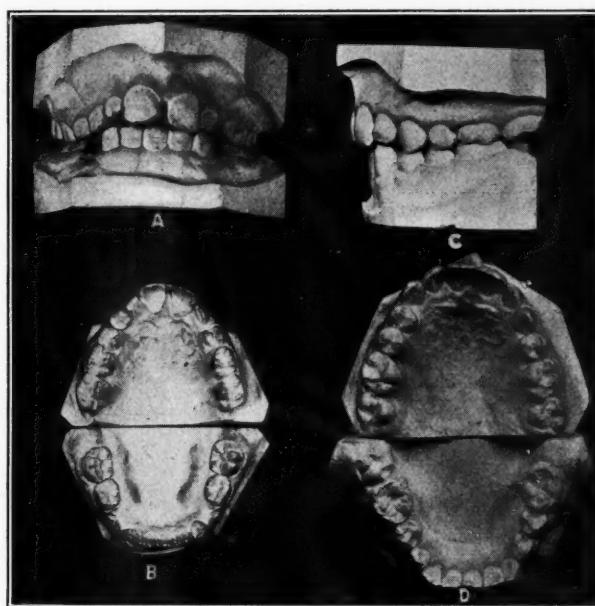


Fig. 4.—Patient aged eight years, six months. *A*, Front view, models in occlusion; *B*, occlusal view. Class I, probably as a result of early loss of $\overline{dc} \mid \overline{ed}$ the spaces for $\overline{54} \mid \overline{45}$ have closed considerably and are too small. The maxillary incisors have moved to the left and the mandibular ones to the right, so that the respective center lines are similarly misplaced. In treatment $\overline{4} \mid \overline{4}$ were extracted; maxillary incisors were brought back and aligned, size of mandibular arch and spaces maintained. Extraction has simplified the treatment of this case. The teeth showed considerable liability to caries. The result at the age eleven years, ten months, is shown in *C*, left side in occlusion, and *D* occlusal view. (Bennett, *The Science and Practice of Dental Surgery*, permission of Oxford Medical Publications.)

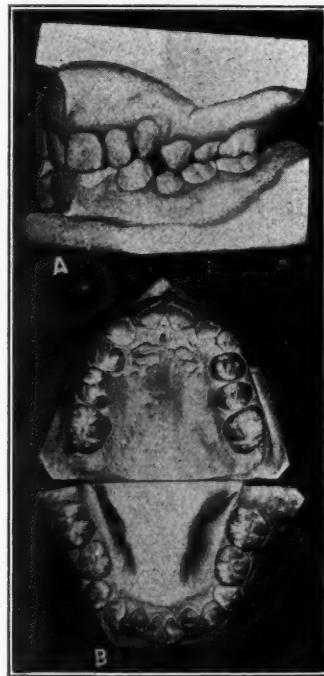


Fig. 5.—Age thirteen years, nine months. *A*, Left side in occlusion; *B*, occlusal view. Class II, Division 2; $\overline{5} \mid$ absent; considerable caries, $2 \mid 2$ poorly calcified; $2 \mid 2$ extracted. Five months later no contraction of maxillary arch had taken place. No mandibular teeth were extracted; had this been done, probably both arches would have contracted. (Bennett, *The Science and Practice of Dental Surgery*, permission of Oxford Medical Publications.)

mately the center of each half, and so its loss gives increased room for the teeth in front of it and behind it. It must be remembered that many cases of malocclusion are the result of smallness of the whole maxilla and mandible and that this is expressed in various ways, frequently by insufficient room for the laterals and canines; hence the removal of the first premolars is very satisfactory (unless

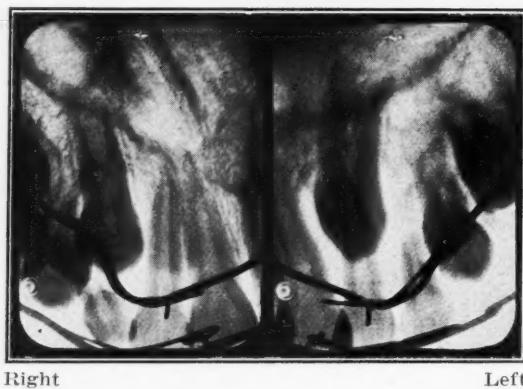


Fig. 6.—Patient aged nine years, nine months. Class II, Division 2. Considerable crowding; to be treated by removal of one tooth on each side. On the right side the first premolar will be removed; on the left side the lateral, as the canine is very much medial to normal and might assume the position, or even a worse position than that shown in Fig. 13.

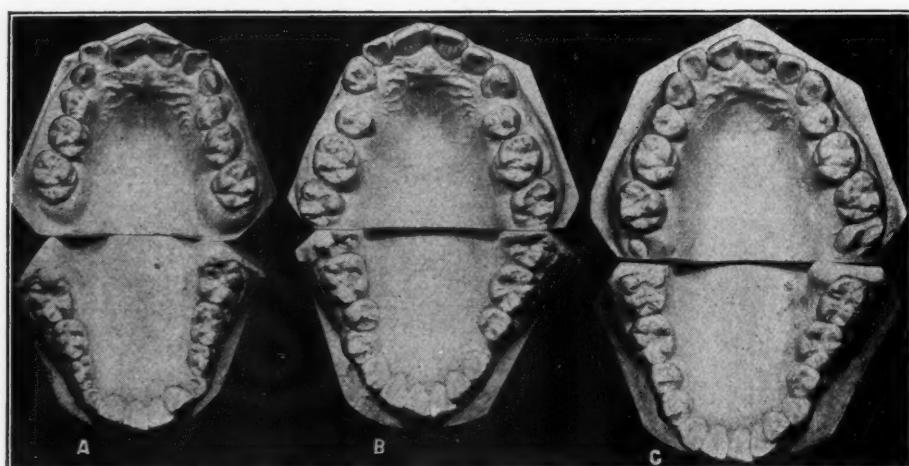


Fig. 7.—Age eight years, eleven months. Class II, Division 2 malocclusion. *A*, Original condition, when patient was eight years, eleven months old, treated by extraction of $\frac{dc}{dc} | \frac{cd}{cd}$. Two and one-half years later $\frac{4}{4} | \frac{4}{4}$ extracted. *B*, Patient thirteen years old, shows improved alignment of the maxillary incisors. *C*, Patient twenty years old, shows the premolar spaces closed and the maxillary third molars erupting. The maxillary incisors have relapsed toward their original positions; the mandibular incisors show increased imbrication. (Bennett, *The Science and Practice of Dental Surgery*, permission of Oxford Medical Publications.)

the tooth actually misplaced is removed). Occasionally it is better to remove the lateral than the first premolar as when the lateral is carious and not well placed in the arch or when the canine occupies a medial position (Fig. 6). The loss of the first premolars rarely leads to any permanent spacing (Fig. 7). Spacing, tilting, etc., is more liable to occur after the removal of first permanent

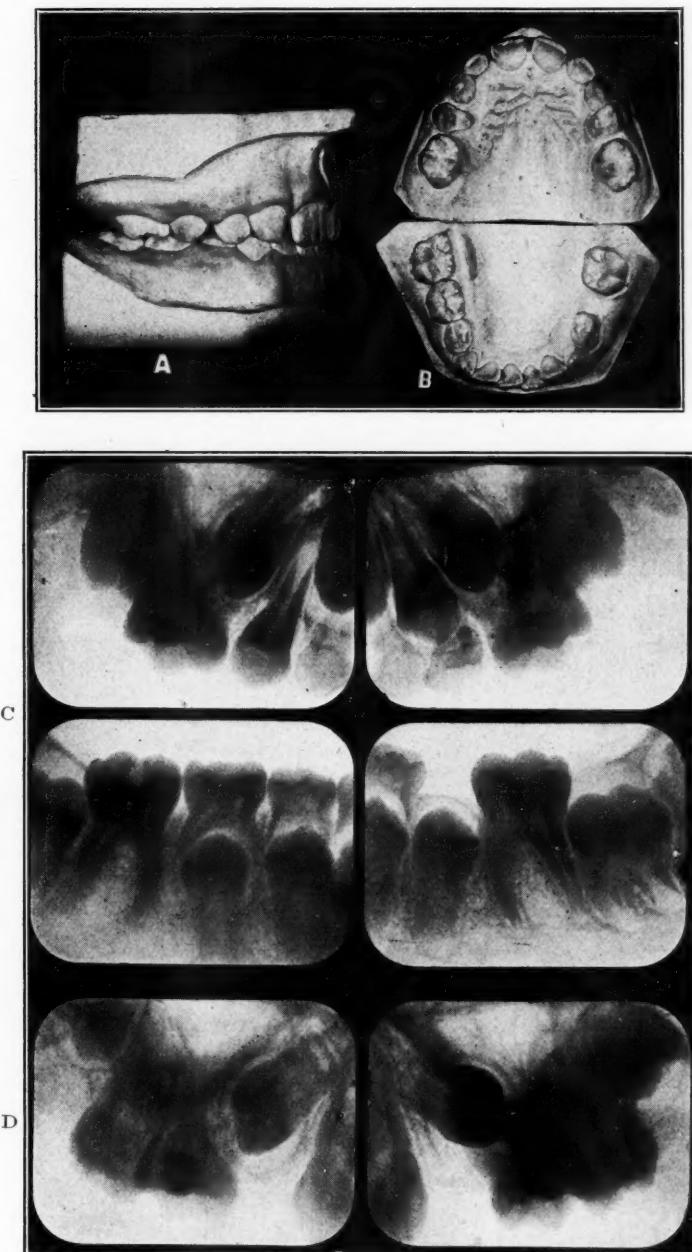


Fig. 8.—Patient aged nine years, eleven months. *A*, Right side in occlusion. *B*, Occlusal view. Normal occlusion except for probable premature loss of $5|5$ (the history says about sixteen months previously). It has resulted in forward movement and rotation of $6|6$ so that $64|$ and $|6$ are in contact; $5|5$ will be shut out of the arch. The treatment is to remove these teeth; no other treatment should be necessary to obtain a satisfactory alignment and occlusion. If $4|4$ are removed, as has been done, $6|6$ are liable to move medially before $5|5$ erupt, so the space for them should be retained, and if they erupt lingually, they must be moved into line. *C*, Radiographs show that all the permanent teeth are present.

Patient eleven years, eleven months old. *D*, Radiographs show that $4|4$ have been extracted and that $5|5$ are still unerupted. It appears as though the spaces for these teeth have closed since the previous x-ray pictures showing the necessity of retaining the space if the first premolars are removed. (Bennett, *The Science and Practice of Dental Surgery*, permission of Oxford Medical Publications.)

molars, which should never be removed except on account of severe caries, etc. Permanent spaces are very undesirable and should be avoided.

Undue medial movement of first permanent molars is usually best treated by removal of a premolar⁵ (Fig. 8) either first or second, except in the mandibular arch in Class II cases; it is possible to move such molars distally. The older the patient, the more extraction is indicated if it will simplify the treatment.

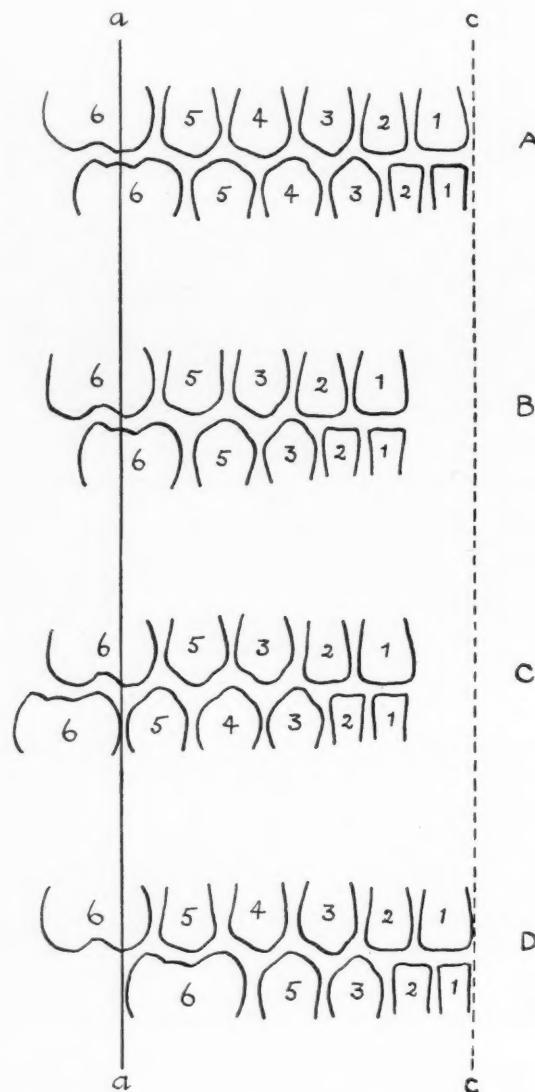


Fig. 9.—Diagrammatic representation of the occlusion to be attained:

- A, Normal; when all the teeth are retained
- B, When $\frac{4}{4}$ have been removed
- C, When $\frac{4}{4}$ has been removed
- D, When $\frac{4}{4}$ has been removed

} Arch-relationship normal

} Arch-relationship not normal

In each case the number of cusps and the occlusion are such that every tooth is fully functional; the occlusion is similar on both sides. The vertical lines through the mediobuccal cusp of the maxillary molar is to indicate that this tooth is regarded as a fixed point in the Angle classification. (Bennett, *The Science and Practice of Dental Surgery*, permission of Oxford Medical Publications.)

As Applicable to the Angle Classification

The principle to be applied is to make the number of cusps in the two arches correspond so that the maxillary and mandibular incisors may be brought into correct relationship without changing the arch-relationship (Fig. 9). If the arch-relationship is normal (Class I), this is accomplished by removing the same number of cusps from each arch; if the arch relationship is abnormal, as in Class II and Class III, by removing cusps (teeth) from one arch so that the remaining maxillary and mandibular cusps will balance. Thus, Class II cases (postnormality of the mandibular arch, say, to the extent of one cusp on each side) may also be referred to as one cusp too few on each side in the mandibular arch; similarly in Class III cases there is one cusp too many on each side in the

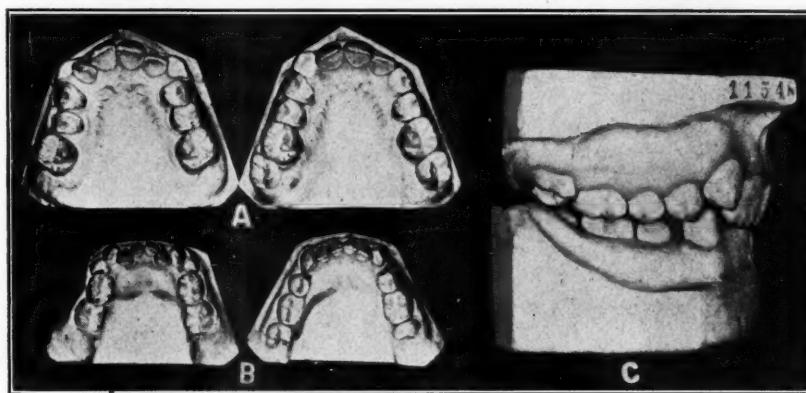


Fig. 10.—Patient aged eleven years, three months, and twelve years, ten months. *A*, Occlusal view of maxillary teeth. *B*, Occlusal view of mandibular teeth. *C*, Right side in occlusion.

Patient aged twelve years, ten months, Class I, treated by extraction of $2 \frac{1}{4} | 4$; $2 \frac{1}{4}$ removed in preference to $4 \frac{1}{4}$ because it was badly rotated. Nineteen months later $3 \frac{1}{4}$ is seen to be shut out of the arch by medial movement of the right maxillary cheek teeth; this could have been avoided by putting in an appliance to retain the canine space until it was occupied by this tooth. Three years after the extractions there was no contraction of the maxillary second premolars and maxillary and mandibular permanent molars. No treatment except extraction. Considerable improvement in the alignment of the incisors. (Chapman, *Tr. B. S. S. O.*, 1928. *Dent. Rec.* 48: 675, 1928.)

mandibular arch. In Class II cases the occlusion may be balanced by removing one cusp from each side of the maxillary arch, e. g., the two first maxillary premolars, and in Class III cases the two mandibular first premolars might be removed; in both classes these principles apply only if the arch-relationship is not corrected.^{2,6} It must be remembered that these are theoretical considerations which apply in a number of Class II cases, especially the older ones, and particularly in Division 2; they rarely apply in Class III cases. The principles enunciated are to be applied with some elasticity, i. e., each case must be considered on its own merits.

Class I Cases.—The correct and ideal treatment of typical Class I cases is to reduce the size of all the teeth so that they will conform to the face, if it is true that the face is the correct size and the teeth are too large. This is an impracticable treatment, so one of two other courses has to be adopted, either: (1) to enlarge the jaws to accommodate all the teeth; or (2) to reduce the number of

teeth so that the remainder can be accommodated in the jaws without enlargement.

In Class I cases the number of cusps in the maxillary and mandibular arches balances because there is symmetrical underdevelopment of the arches and no error of arch-relationship; if the jaws are so small that the removal of the first premolars will allow the remaining teeth to align themselves without any spaces, that appears to be the correct solution (Figs. 10 and 14) : excess space, if

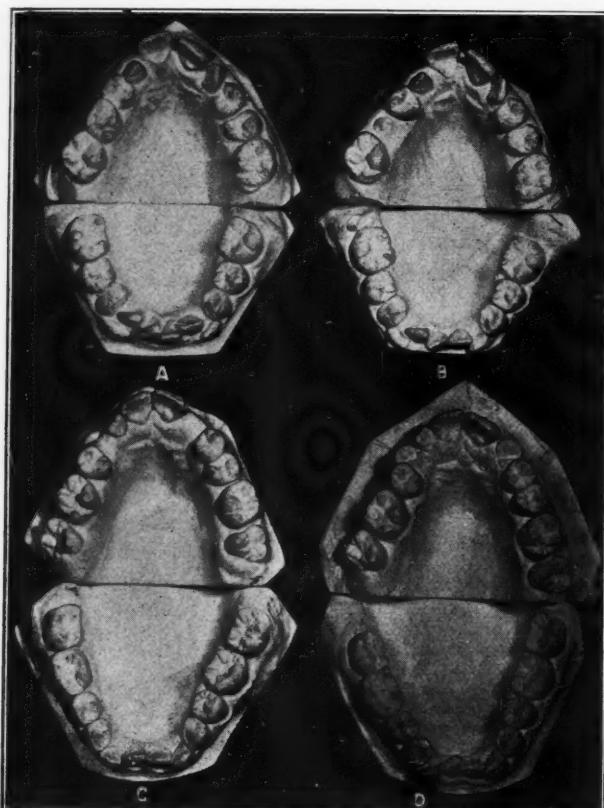


Fig. 11.—Patient aged thirteen years. *A*, Occlusal view, Class I, maxillary canines almost entirely shut out from the arch. Mandibular incisors very crowded.

Patient aged thirteen years, five months. *B*, Occlusal view; $\frac{1}{1}$ extracted at age of thirteen years, one month.

Patient aged fifteen years, eight months. *C*, Occlusal view. $\frac{4}{1} \frac{2}{1}$ were extracted at about the age of thirteen years, six months, and the teeth aligned.

Patient aged eighteen years, five months. *D*, Occlusal view. Mandibular premolar and canine region narrower than at date of previous models and the two incisors overlapping. Patient has worn a mandibular vulcanite retention plate since age of fifteen years, eleven months. Ten months later there had been relapse in the mandibular arch due to insufficient wearing of the plate. A new one was made; the wearing of this was continued indefinitely after the age of eighteen years. A maxillary removable retention plate was worn at the age of eighteen years, six months. Both plates gradually to be worn less.

any, will usually be closed in time by medial movement of the posterior teeth (Fig. 7). But in a case of less severity the loss of half a premolar on each side may suffice; as this is an impossible operation, then the arches may be enlarged, when they will be a little too large for the face; or teeth may be removed, when the arches will be too small for the face; either may be good treatment. If each half of each jaw is too small by half a premolar, then the removal of one premolar would enable the arches to remain the original size.

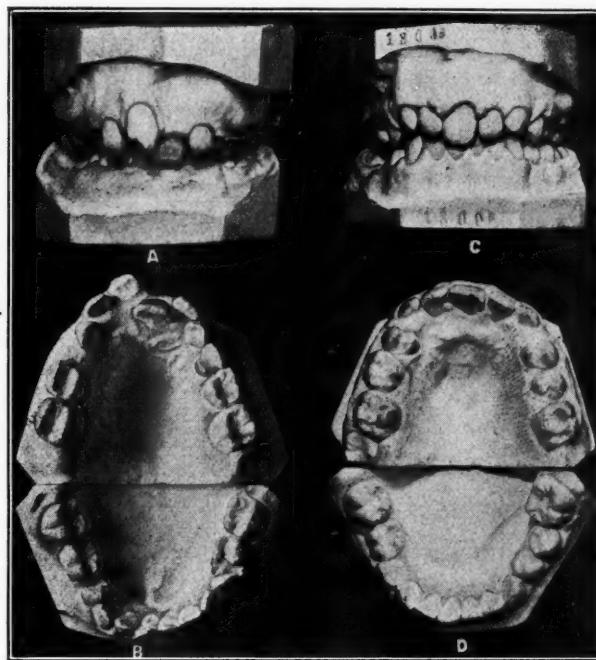


Fig. 12.—Patient aged ten years, eight months. *A*, Front view, models in occlusion. *B*, Occlusal view. 1 damaged by fracture, extracted. 32 | 123 aligned; no treatment of the mandibular teeth.

Patient aged twelve years, *C*, Front view, models in occlusion. *D*, Occlusal view. (Bennett, *The Science and Practice of Dental Surgery*, permission of Oxford Medical Publications.)

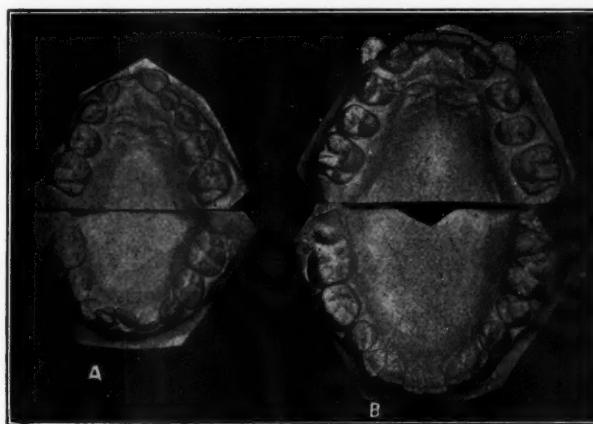


Fig. 13.—Patient aged six years, nine months. *A*, Occlusal view. Class II, Division 1. Very small arches.

Patient aged twelve years, seven months, *B*, Occlusal view. Six years later, treatment having been almost continuous, there is insufficient room for the maxillary canines; their position is too medial. In order that treatment might be discontinued it was decided to remove the canines. The first premolars, however, were removed and the canines are now to be brought back. Another method of treatment would have been to remove the laterals.

If the position of the teeth is not symmetrical and (or) the removal of only one premolar from each arch (not necessarily on the same side) will permit the others to be in good line, then the writer favors this course even though it may allow the center line to move toward the side from which the tooth has been removed or the maxillary and mandibular center lines to move in opposite directions. He believes this is preferable to sacrificing one or two additional teeth (Fig. 4). These suggestions are for similar treatment in both arches, although

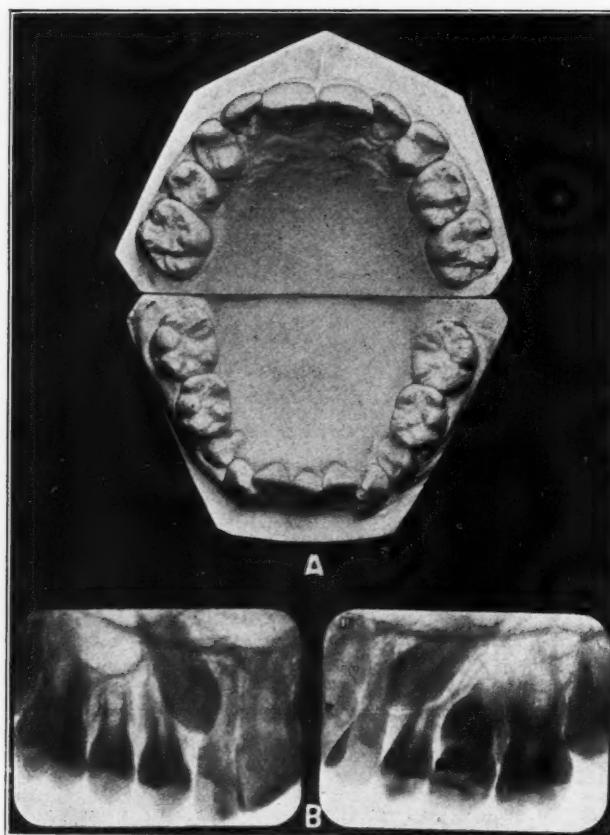


Fig. 14.—Patient aged ten years. A, Occlusal view. Probably Class II, Division 2. Arches very small, $3 \frac{1}{3}$ entirely shut out and some crowding of the teeth in the arch; $\overline{1}$ extracted several years before; still considerable crowding in the mandibular arch. The writer is opposed to treatment retaining all the teeth in this case (even if $\overline{1}$ were still present; and considers $4 \frac{1}{4}$ or $3 \frac{1}{3}$ should be extracted; as maxillary canines are wider teeth than first maxillary premolars, the writer would remove the canines to avoid the possibility of their prominence in any event, or of their increased prominence as a result of loss of some space which is almost sure to occur if $4 \frac{1}{4}$ are extracted.

B, X-ray pictures show the unerupted canines.

the writer is more hesitant to remove teeth from the mandibular arch than from the maxillary one.

The loss of teeth from both arches or from the mandibular arch only is liable to be followed by contraction of both arches, but loss of maxillary teeth is not likely to be followed by contraction of either arch; the loss of mandibular incisors is certainly liable to be followed by contraction of one (Figs. 3 and 11) or both arches. Whether this ever happens if mandibular premolars are removed is uncertain, but their loss is much less likely to be followed by disastrous results

in cases of crowding than if incisors are removed. The writer has removed two mandibular first premolars with good results including an improved alignment of the six anterior teeth (Fig. 10). If the crowding is not severe, and sometimes when it is, the writer advises that no teeth be removed from the mandibular arch, because then there is no fear of it (the mandibular arch) becoming smaller. The mandibular teeth are less noticeable than the maxillary ones, so their alignment is less important. In addition, the maintenance of the size of the mandibular arch (as is assured if the mandibular arch of teeth is left intact) ensures maintenance of the size of the maxillary arch. Hence maintenance of the size of the mandibular arch is of greater importance than the appearance of the mandibular teeth. (This paragraph should also be read as applicable to *Principles of Extraction General.*)

Class II Cases.—The number of cusps may be made to balance by the removal of one maxillary cusp from each side in the maxillary arch (Fig. 9). The position of the mandibular arch is not changed; mandibular teeth should very rarely be removed, as this would accentuate the postnormality of the mandibular arch by making it smaller both anteroposteriorly and laterally.

Division 1.—The treatment of these cases after removal of the two maxillary first premolars is to bring back the six anterior teeth. In the writer's opinion this may present as great difficulty as treatment in which all the teeth are kept and the mandible is brought forward. The prognosis of the latter treatment is very good if undertaken at the best age, and it is doubtful, except in exceptional cases, e. g. patients over twelve years of age, whether treatment by extraction of the two maxillary first premolars and retraction of the six anterior teeth, has any advantages over treatment without extraction. A mandibular tooth should never be removed.

Division 2.—When the maxillary first premolars have been removed, only the laterals and canines (if the latter are erupted) have to be moved back. If the treatment is begun early, the deciduous canines may be removed to facilitate moving the lateral, and if the premolars are extracted as soon as they appear, the canines may assume satisfactory positions without treatment. The writer regards this as a very satisfactory form of treatment. On the other hand, these cases give good results without extraction providing the age is satisfactory; patients twelve years of age and over should certainly be treated by extraction.

Class III Cases.—The use of intermaxillary force is a necessity in these cases, and only exceptionally is extraction indicated. These cases are the reverse of those belonging to Class II, and so it is very rare that the removal of a maxillary tooth is called for.

As Applicable to Individual Teeth

Maxillary Teeth

Centrals.—These are never removed unless they have been damaged by some injury. In such cases the writer is in favor of closing the gap by moving the approximal teeth toward it, so that the permanent wearing of an artificial appliance may be avoided. The writer has treated one case in this manner with satisfactory results (Fig. 12). There was crowding of the six anterior teeth, a condition

which facilitated this method of treatment. Packham⁸ reports a case showing an excellent result; a mandibular incisor was also removed in this case.

Class II, Division 1 Cases are usually unfavorable for this method of treatment; yet they are the commonest types of cases in which injury and loss of the maxillary central incisors occur, and in these there is usually more than sufficient room for all the anterior teeth. The writer has never treated one of these by closing the space, as he has not felt that it could be done satisfactorily. In these cases the space has been retained by a fixed splint until such time as an artificial substitute could be worn with little risk of breaking it.

Laterals call for removal more frequently than centrals. Cases in which it may be permissible are: severe rotation (treatment of this condition has been known to result in apical absorption; absorption of a similar character is believed to occur when there has not been any orthodontic treatment) caries (Fig. 5) and abnormal form. When the canine occupies a position medial to normal so that it will erupt into the position of the lateral more satisfactorily than that of the premolar, it may be good treatment to remove the lateral and let the canine take its place. (Figs. 6 and 13.)

Canines.—These are very rarely removed on account of their value in maintaining the facial expression. In particular cases their removal may be justified, e. g., Fig. 14, and when impacted. Many impacted canines can be brought down and into line, but their position is not always pleasing; there may be some that it is practically impossible to bring into line. In any event the correction of the position of these teeth takes a year in the simpler cases and may take two or three times as long in more difficult ones. Of course, it is not essential that such teeth should be brought into line or extracted, they may be left in situ so long as they do not cause trouble. Occasionally, in order to avoid treatment with appliances, canines may be removed, e. g. Fig. 14; also when they assume a very medial and ugly position (Figs. 6 and 13), although it usually would be better to remove a lateral in such cases.

First Premolars.—As a rule these are the best teeth to remove, for reasons already given.

Second Premolars.—These may be removed instead of first premolars if structurally they are not so good or their position is such that apparatus would be needed to bring them into line and the first premolars are already in satisfactory positions, e. g. in cases of medial movement of the first permanent molars (Fig. 8).

First Permanent Molars.—These teeth are only removed when they are carious and the condition of the premolars is much better and their probable life longer.

Mandibular Teeth

Incisors.—It is seldom wise to remove a mandibular incisor because the arch is liable to contract and no improvement of the irregularity results. However, if one is removed, the case must be watched to see that the teeth do not crowd further, and if a tooth has to move into line, to see that it does so, or is moved there before the space for it closes (Fig. 3). When the canine is labial to a mandibular lateral, the latter may be removed to allow the canine to occupy its place

but the precautions just mentioned must be taken. The writer is inclined to the opinion that it may be preferable to defer the removal of such a tooth until the patient is fourteen or fifteen years of age, as it is probable that at this age there is less likelihood of the arch contracting.

Canines rarely call for removal; they may be impacted similarly to maxillary canines but this condition is rarer.

First Premolars.—These are the teeth usually chosen for removal, for reasons already stated. When the second premolar is crowded out, due to abnormal medial movement of the permanent molar, it may be better to remove the first premolar and allow the second one to take its position, though in other cases it may be preferable to remove the second premolar.

First Permanent Molars.—These should not be removed unless extensive caries has considerably shortened their probable life.

Second permanent molars are occasionally impacted against the first molars much as maxillary first permanent molars are impacted against second deciduous molars; the removal of the second molar may be necessary.

SUMMARY AND CONCLUSION

Nonextraction as a principle to be followed in all cases of orthodontic treatment is neither scientific nor practicable. In view of the difficulties and length of treatment, also the prognosis, nonextraction is not always in the best interests of the patient. Changes can be produced, improvements obtained and, to some extent, retained, but relapses are frequent, even though treatment has been carried out in accordance with recognized principles. Relapses do not always take the form of the original condition.

Some guidance as to when and what to extract has been given, but each case must be considered on its merits. The same careful attention to the detailed treatment of these cases, as has been given to those in which there has not been extraction, should lead to considerably increased knowledge and benefits to one's patients.

There are many cases in which extraction is not indicated, i. e., it is definitely prejudicial to the result, but there are many in which the writer believes it to be the better course.

Reports of successful and unsuccessful treatment both where extraction has and has not been performed are essential if the general knowledge of practical orthodontics is to be increased. Experience of actual results in practice is a better basis for treatment than are dicta.

Many have extracted teeth in the belief or hope that the case would improve without anything further being done; many a time there has been no improvement. It must not be overlooked that very frequently extraction alone is of little use and that the technical difficulties necessary to treat the case satisfactorily after teeth have been extracted may be as great as if none had been removed.

On the other hand orthodontic literature tends to give the impression that any and every case, irrespective of any qualifications or conditions, can be successfully treated if all the teeth are retained and "normal occlusion" obtained; this is not so and the time has arrived to acknowledge it.

Neither extraction nor nonextraction is a panacea; each has its place in orthodontic treatment. It is for the profession to find those places and to decide which teeth are the best to remove in particular circumstances.

REFERENCES

1. Badeock, J. H.: The Place of Extraction in Orthodontic Treatment. Proc. First Internat. Orthodontic Congress, p. 402, 1926
2. Bennett, Sir Norman, G.: The Science and Practice of Dental Surgery, Oxford Medical Publications, 2 ed., 1931.
3. Colyer, Sir Frank: Abnormal Conditions of the Teeth of Animals in Their Relationship to Similar Conditions in Man. Published by The Dental Board of the United Kingdom, June 1931.
4. Colyer, Stanley: The Regulation of the Teeth as a Predisposing Cause of Chronic Infection of the Jaws, and a Demonstration of Illustrative Radiograms (unpublished).
5. Grieve, George W.: Some Theories Obstructing the Progress of the Science of Orthodontia, Dental Cosmos, **73**: 560, 1931.
6. Heath, John: Practical Methods of Treating Malocclusion for the Masses, Dent. Mag. and Oral Topics, **48**: 235, 1931.
7. Keith, Sir A., and Campion, G. G.: A Contribution to the Mechanism and Growth of the Human Face, Tr. B. S. S. O. p. 89, 1921, Dent. Rec. **42**: 61, 1922.
8. Packham, A. L.: A Case Showing Tooth Movement, Tr. B. S. S. O. p. 40, 1926, Dent. Rec. **47**: 471, 1927.

DISCUSSION

Dr. Sheldon Friel, Dublin, said that Mr. Chapman had pointed out that two extreme points of view were held on the subject of extraction as a part of orthodontic treatment, and he quite clearly showed that there was a very definite place for extraction.

The nonextractionist ignored the fact that in a certain number of cases he was dealing with marked underdevelopment which may be of an hereditary nature and in other cases may be of such long standing that growth will not respond to the stimulation of his appliances. Nobody questions the ability of these orthodontists to move teeth into regular arches and into normal relationship with each other, but one does question their ability, in some marked cases of malocclusion, to develop the apical bases and even more so, the underdeveloped masticatory face to such an extent that the teeth will remain in their correct relationships and will be in harmony with the rest of the face. He felt that one was not justified in extracting teeth as a part of orthodontic treatment in children under the age of eight years, except in cases where there had been a previous extraction or for caries. The effect of extraction, especially in the mandible was to inhibit the forward movement of the teeth through the alveolus which Brash's experiments show conclusively to take place. In every case of early extraction, either of a mandibular incisor or of a mandibular deciduous or permanent molar, the dental arch does not develop to the extent that it would have done without the extraction.

The growth changes that take place in the two jaws both in regard to size and in regard to relationship with one another are not fully appreciated, and even if extraction has to be carried out at a later date during the course of the treatment, more will have been gained in development than by an early extraction whether it be of deciduous or permanent teeth.

From his clinical observations the extraction of mandibular first permanent molars appeared to stop development anterior to the extraction. It seems that the medial movement of teeth through the alveolus takes place as a result of pressure from the posterior teeth through all the anterior ones and that extraction breaks the continuity of the arch and so the anterior portion is deprived of its stimulus to move forward. The maxillary dental arch keeps on growing forward, but the mandibular dental arch in its anterior region lags behind, so that the relationship of the mandibular premolars to the maxillary premolars becomes postnormal. The closing of the spaces for the first permanent molars is brought about by a forward and tilting movement of the second molars, rather than by any backward movement of premolars. Such a type of case is quite different in facial appearance to a mandibular postnormal arch relationship case (Angle Class II). The latter is characterized by poor development of the mandible as a whole, whereas the postnormal cases due to extraction have a well-developed chin but the mandible is too short.

There is another type of case in which this inhibitory action due to extraction of mandibular first permanent molars does not seem always to have the desired result. This is in the treatment of mandibular prenormal arch relationship (Angle Class III). Here the forward development of the mandible is much more apparent in the basilar portion than in the alveolar portion. After extraction the mandibular incisors may become inclined lingually, which only accentuates the protrusion of the chin.

Mr. Chapman has advised against the extraction of first permanent molars, especially mandibular, except in cases of necessity owing to caries. It has been claimed that early extraction of these teeth prevents the impaction of third molars. He (the speaker) did not think this was the case, for the jaws are shortened by the amount of the lost tooth. At a later age extraction of second molars would do much more good.

Few people realized the functional standing of the first permanent molars. When testing with a dynamometer, the pressure that can be exerted between either the second premolars or the second permanent molars is usually about half the pressure that can be exerted between the first permanent molars.

Mr. Chapman also advised against the extraction of mandibular incisors, except in exceptional cases. He (Dr. Friel) had once advised it to be done where there was very marked crowding of maxillary and mandibular incisors in a patient aged seventeen years. Several other cases had been under his care, where a mandibular incisor had been extracted previously and the result to his mind had been very poor. In most cases he had to compensate by the extraction of the two maxillary first premolars.

The type of case that was particularly favorable for treatment by extraction and further mechanical treatment was one in which the maxillary canines were excluded from the arch by the forward drifting of maxillary premolars and molars primarily due to premature extraction of deciduous teeth. In such cases it was undesirable to move distally premolars and molars on account of possible impaction of third or second molars and also on account of the time that it takes to carry out such treatment. The extraction of the first premolar and the moving of the canine into the space give a satisfactory result. In the mandible one does not meet with exactly the same type of case. A slight anterior prenormal arch relationship (Angle Class III) the maxillary incisors being labial to the mandibular incisors and there being an overbite of the maxillary incisors over the mandibular incisors; and the exclusion of the mandibular canines from the arch is similar, but its etiology is different. The basilar portion of the mandible is in medial relationship, and it depends upon the extent of development of this basilar portion whether the extraction of mandibular first premolars will do any good. In some cases of excessive development he thought it made matters worse as he had mentioned previously.

He (Dr. Friel) had gone through the last 200 cases in his private practice that he had had under treatment to see the number that had teeth removed as part of orthodontic treatment. There were sixteen cases or 8 per cent. Four had normal arch relationship (Angle Class I). Ten had mandibular postnormal arch relationship (Angle Class II). Two had mandibular prenormal arch relationship (Angle Class III).

It had been his advice to students that they should consider what was best for the patient; whether they were capable of carrying this out; and, last, whether extraction would materially assist them in getting a result. He warned them about the extraction of mandibular teeth.

Mr. Chapman's paper indicated the way to place treatment by extraction, with or without further mechanical treatment, on a more sure basis.

Dr. Harry Kelsey, Baltimore.—He wanted to say that we know very little about this matter because we have ignored it in the past and we are only beginning to take this matter up seriously. The specialist had so ignored it that he had kept his eyes shut as to the possibilities of extraction. The result was that he knew less about it than Dr. Wallace who had not been so prejudiced.

Dr. Hugh Tansey, Kansas City.—If he understood Mr. Chapman's paper correctly he disagreed with him in regard to extracting the first premolar, which he understood Mr. Chapman to say gave good results. The latter also stated that sometimes it was advisable to ex-

tract a lateral incisor. He (Dr. Tanzey) thought it was almost never permissible to extract any of the six anterior teeth, and his paper which would be read before the Congress would show about thirty different cases to prove that it was not entirely satisfactory to extract the first premolar. This is because it lessens the size of the arch and changes the appearance of the patient. He preferred in many instances, especially in adult cases, to take out first or second permanent molars either in the maxilla or in the mandible, or both, according to the indications.

He did not know whether he had understood Mr. Chapman correctly in what he said about treatment by appliances. He thought it was almost never permissible to extract teeth unless appliances were used in addition. He thought intermittent treatment over a period of four or five years was permissible. It was not desirable, of course, but it was often necessary.

Dr. Grieve, Toronto, said he would like to say something in regard to the point raised by Dr. Tanzey. The latter said he would extract the second molar rather than the first premolar. He had in his mind always a definite reason why he should extract, and he thought Dr. Sim Wallace had hit the nail on the head as to why we should extract, because the teeth had drifted forward from their normal position on the base. In his opinion the first premolar was the desirable tooth to extract.

Mr. Chapman spoke of a period of treatment about eighteen months and a period of retention following that not to exceed four years in all. This idea of having patients wearing plates every day of their lives was all wrong.

If the teeth were placed on a sound foundation, no retention whatever should be required.

Dr. Quintero, Lyons.—There were only two points he would like to mention in connection with Mr. Chapman's paper. Mr. Chapman said that we are practically never justified in extracting mandibular incisors. He (the speaker) thought perhaps that the only case in which we were justified was when the maxillary laterals are missing and the maxillary canines come in contact with the centrals. In such cases it was, in his experience, practically impossible to develop the maxilla sufficiently, and he did not believe in inserting artificial dentures in children to replace the missing laterals. Therefore, he considered it good practice in such cases to extract one and sometimes two mandibular incisors.

The other point he wished to emphasize was the fact that we were never justified in the extraction of deciduous teeth as a prophylactic measure, as in his experience this always brought about failure and irregularities in the permanent dentition.

Mr. Harold Chapman, in reply, said he was very much indebted to Dr. Friel for his able opening of the discussion. He was particularly impressed by Dr. Friel's remark that he did not advise extraction of deciduous or permanent teeth under eight years of age and regarded the extraction of mandibular molars with disfavor.

He had been inclined, perhaps, to extract deciduous canines before eight years of age in Class I cases where he had decided to remove ultimately the first premolars, but Dr. Friel had practically convinced him that it would be better to defer that.

Fig. 10 showed that to remove three premolars and a lateral at eleven years of age had resulted in a great improvement of the alignment of both maxillary and mandibular incisors.

He did not entirely agree with Dr. Tanzey. He did not see the advantage of removing the second molars and then having to move back the two premolars and canines. He thought that if we were going to use extraction to help us in treatment it should be of great assistance. It should assist us to eliminate appliances altogether, but if the second molar was removed, this did not happen.

In the case he showed of a boy of thirteen years (Fig. 5) in which the laterals were poorly calcified and already carious when he first presented, he could not believe that it would have been better for that boy to have his first premolars or second molars removed. He thought that the tendency to decay would have been greater than it was. In his opinion that patient was better off with premolars in sound condition than with laterals of poor quality.

In regard to adult cases we should be sure that the advantages of our treatment would outweigh the disadvantages. Several of the cases which he showed were to emphasize the fact that if teeth are taken out so that others can occupy certain positions we must see that the teeth are moved into them.

Dr. Grieve told us that he had had definite reasons for extractions. He also felt that he had definite reasons for extractions and the full text of the paper brings these out. He was prepared to go a considerable distance with Dr. Grieve but not all the way. Dr. Quintero told us that he removed mandibular incisors in certain cases. He should like to know details of them, because he recalled more failures than satisfactory results from such treatment.

Dr. Kelsey practically summed up this discussion for him when he said that this is a subject of which we know very little, and while there are comparatively few who are treating orthodontic cases on the lines which he might say were recognized by the Congress, there may be thirty or more practitioners to every specialist, who are treating cases by extraction. If they had the records they could possibly answer many of these questions of which we want the solution, but that evidence is not available, and probably never will be; therefore a body such as this must take on this duty and then supply the general practitioner with the information which will enable him to do the best for each patient in the particular circumstances in which he or she is placed.

CAUSES OF INACCURACIES IN MODELS AND THEIR PREVENTION IN IMPRESSION TAKING*

THOS. GOODHUGH, LONDON, ENGLAND

WHILE the whole of my subject is not entirely to do with orthodontics, yet I submit that the vast number of plaster models shown in this Congress is sufficient justification for its inclusion for our consideration. I desire to place the subject before you in its entirety, as it is the first time it has been demonstrated outside of my practice.

The formulas and impression methods are the result of ten years' experimenting and are incidental to twenty years' research work in the production of dental filling cements. In support of this I refer you to my work on the *Art of Prosthetic Dentistry*, published in 1924, by Messrs. Baillière, Tindall & Cox.

I do not propose to demonstrate the advantages, or otherwise, of any existing methods, or even to dwell on inaccuracies which are common and obviously caused by faulty and even careless impression taking, but shall pass on to the sections of my subject:

1. The plaster of Paris model.
2. The impression.
3. The denture.

THE MODEL

This is a physical and a chemical problem. When plaster of Paris is used in the ordinary way, with water only, the model is very porous and also very dry from excessive dehydration. Porosity may be observed with the naked eye, and dust collecting over its surface shows it up plainer still. Excessive dryness is shown by the bubbles of displaced air which escape when a model is placed in water. This also accentuates the amount of porosity which is present. Now, when a flask containing a packed vulcanite denture is vulcanized, the porous structure of the model gives way when softening of the plaster occurs during the process of vulcanizing. Coupled with this, the amount of dehydration which has occurred in a model more than four days old shows that warpage must occur, as it has been deprived of one-quarter, approximately, of its original bulk in weight. These two things form a great inaccuracy in themselves, apart from any further consideration.

The next inaccuracy with which I wish to deal is a considerable one also. When we fit a denture in the mouth, it is supposed to fit accurately. When a vulcanite or even a gold plate is ready for fitting, we regard the fitting side as being the exact counterpart of the gums to which we fit it. When we take an impression we place a soft material onto the harder substance of the gums, but when we fit the denture we are placing a very hard substance onto the softer substance of the gums. At once an inaccuracy arises and it is one of degree. It may pass from something unimportant to serious displacement and rocking, and

*A demonstration given at the Second International Orthodontic Congress, London, July, 1931.

even great pain. It also may show itself ultimately by the fracturing of the denture owing to uneven bearing pressure from either standing teeth or masticating pressure onto a rocking base.

The gums of the mouth usually present a complex surface owing to their variation in density. There may be a very soft, flexible alveolar ridge, or a very soft area on each side of the palatal vault, or a very hard area on the alveolar ridges and around the rugae and down the central area of the palate even as far as the soft palate. In the mandible there may be lumpy spots and hard ridges, while the floor of the mouth presents a changing surface.

I observe in a large number of edentulous mouths, where large dentures are to be fitted, that the peripheries of the gums are apparently soft, especially at the throat areas, in both the maxilla and the mandible. I am aware that muscle trimming methods with modeling compound are employed by some dentists with good effect, but this takes a lot of time, and it does not appear to other dentists to be a workmanlike procedure to tamper with an impression.

Apart from methods of muscle trimming under pressure we have found from prolonged observation in fitting dentures that the greater part of most mouths exhibit a general surface tension. In the posterior inner areas of the maxilla and mandible the base of the tongue and swallowing muscles affect the position of the gum surfaces for a long distance from the peripheries of the maxillary and mandibular dentures. The fascia or aponeurosis of tissue rises and falls like a hard bank in proportion to the driving force of the muscles behind them. We also find that even hard zones along both alveolar ridges and rugae areas are movable under pressure from the denture.

The definite conclusion which I have formed after many years of intensive experience is that an impression must not only record the position of the mouth as it appears but accurately register the subtle positions of all the movable areas of the mouth tissues in their normal positions. I have tried various methods of using dense impression materials and am satisfied that any uneven pressure exerted on the tissues produces chaos with regard to the ultimate pressure which occurs when the denture is fitted. The model, therefore, should be the duplicate of the tissues of the mouth in their normal positions and free from tension.

Before passing to my method of taking impressions I shall give you my ultimate formula for a solution to mix with plaster of Paris:

Gum arabic	= 10 dwt., troy weight
Water	= 12 fluid ounces
Benzoic acid	= 6 grains, troy weight
Glycerin	= 1 fluid ounce

The method of preparation is to place the gum in the water. If the gum is broken up into small pieces, solution will take place in about four hours. It must be passed through a piece of muslin or similar material in order to filter it from debris. Then the acid which is flocculent must be spatulated on a piece of glass with part of the glycerine. The whole is then shaken up in a bottle.

In using, the mix should be on the thick side when it will be found to exhibit entirely different properties from that of ordinary water and plaster. These are:

1. A different molecular formation of the mass during the period of setting.

2. A closer form of substance with much finer texture and less porosity.
3. A complete chemical mix; nothing will dissolve out and the plaster mass is very hard.
4. When the model is cut away from the vulcanized denture in the flask, it will be found to have no granular formation but cuts more like wax.

Table I, II and III show the differences of molecular setting and hydration in: (1) a solution mix; (2) a pure water mix; (3) a modified solution and water mix.

TABLE I

No. 1.	Weight of plaster Quantity of solution	OZ.	DWT.	GR.	TROY WEIGHT
		4 2½	5 fluid ounces	0	
Weight	one hour after setting	6	8	0	
Weight	11 hours after setting	6	5	6	
Weight	24 hours after setting	6	1	0	
Weight	36 hours after setting	5	19	12	
Weight	48 hours after setting	5	18	0	
Weight	72 hours after setting	5	14	12	
Weight	96 hours after setting	5	12	12	
Weight	120 hours after setting	5	11	0	
Weight	144 hours after setting	5	9	12	
Weight	168 hours after setting	5	9	0	
Weight	192 hours after setting	5	8	12	
Weight	216 hours after setting	5	8	12	
Weight	240 hours after setting	5	8	0	
Weight	264 hours after setting	5	7	12	
Weight	288 hours after setting	5	7	12	
Weight	312 hours after setting	5	7	12	
Total loss of water		1	0	12	

This means that the mass loses one-sixth of its weight approximately. Dehydration stopped at 264 hours.

TABLE II

No. 2.	Weight of plaster Quantity of water only	OZ.	DWT.	GR.	TROY WEIGHT
		4 2½	5 fluid ounces	0	
Weight	one hour after setting	6	8	0	
Weight	11 hours after setting	6	4	0	
Weight	24 hours after setting	6	0	0	
Weight	36 hours after setting	5	10	0	
Weight	48 hours after setting	5	7	0	
Weight	72 hours after setting	5	1	12	
Weight	96 hours after setting	4	19	12	
Weight	120 hours after setting	4	19	12	
Weight	144 hours after setting	4	19	12	
Weight	168 hours after setting	4	19	12	
Weight	192 hours after setting	4	19	12	
Weight	216 hours after setting	4	19	12	
Weight	240 hours after setting	4	19	12	
Weight	264 hours after setting	4	19	12	
Weight	288 hours after setting	4	19	12	
Weight	312 hours after setting	4	19	12	
Total loss of water		1	8	12	

This means that the mass loses one-quarter of its weight approximately. Dehydration stopped at 96 hours.

These relate to three cylinders which were cast from the same bag of plaster and at the same time of day. Each cylinder contained the same weight of plaster mixed with the same quantity of solution or water.

TABLE III

	OZ.	DWT.	GR.	TROY WEIGHT
No. 3. Weight of plaster	4	5	0	
Quantity of equal parts of water and solution	2½	fluid ounces		
	OZ.	DWT.	GR.	
Weight one hour after setting	6	9	0	
Weight 11 hours after setting	6	5	0	
Weight 24 hours after setting	6	1	0	
Weight 36 hours after setting	5	16	0	
Weight 48 hours after setting	5	14	0	
Weight 72 hours after setting	5	11	0	
Weight 96 hours after setting	5	9	0	
Weight 120 hours after setting	5	6	12	
Weight 144 hours after setting	5	5	12	
Weight 168 hours after setting	5	5	0	
Weight 192 hours after setting	5	4	12	
Weight 216 hours after setting	5	4	0	
Weight 240 hours after setting	5	4	0	
Weight 264 hours after setting	5	4	0	
Weight 288 hours after setting	5	4	0	
Weight 312 hours after setting	5	4	0	
Total loss of water	1	4	0	

The mass loses one-fifth of its weight approximately. Dehydration stopped at 216 hours.

THE IMPRESSION

Plaster mixed with this solution has marked properties differing from that of water only. The use of the solution alters the two properties of control and substance. It provides us with an impression material which exhibits: (a) a difference in plasticity; (b) greater surface covering capacity; (c) a finer and closer mass; (d) freedom from tension registration.

When taking an impression with plaster mixed with pure water it becomes refractory directly it comes into contact with warmth and saltiness in the mouth. The mass produces inaccuracies at once in this refractory condition because in order to get what we visualize to be an adequate depth of ridge surfaces we are pressing unduly on the hard and soft surfaces of the gums, which then produces tension.

When surface tension occurs during an impression registration, it will upset the normal positions of all the movable tissues of the oral cavity so that a denture with these registrations on the fitting surface of its hard unalterable substance causes disharmony, discomfort, and lack of stability. (Models were shown demonstrating the same mouth with and without surface tension.) The hard unalterable setting of plaster is regarded as evidence of a correct impression, but in this uncontrollable refractory stage serious inaccuracies may occur and yet the impression may look to be perfect in its contact markings. In using the solution the actual total period of setting is about the same as with pure water. If we arbitrarily fix the setting period into four divisions of time, we

shall find that water plaster is pasty and plastic during the first division, then doughy and refractory during the second and third divisions with hard setting at the fourth division.

When using the solution plaster the pasty, receptive period remains for three divisions of time and then sets rapidly during the fourth division. This plastic condition allows ample time for placing the impression where we require it. Owing to its longer phase of plasticity it can be mixed thicker and its consistency will carry it farther than when water plaster is employed. This condition must not be assumed to be a slower setting quality, as its chemical behavior is quite different.

For orthodontic work and in children's mouths its use is quite suitable, and the mix will allow a thin film of olive oil being passed over its surface.

If it is desirable to hurry the time for setting, equal parts of solution and pure water may be used (as in cylinder No. 3).

When taking large or edentulous impressions, it is desirable to use prepared trays on account of its plasticity. It is also desirable to have a centralized fixed position in order to enable the positions of muscles and aponeuroses to be free from tension. To secure this we first take a modeling compound impression and cast the model. We then select a tray of the "well type" allowing it to cover well the area required without touching at any point. Then wax stops are fitted into the tray so that a centralized position may be secured when in the mouth. The stops may be three or four in number, and fixed somewhat deeply in order to lift the tray well away from every part of the gum tissues. The wax stops are thin deep bars which are placed athwart the ridges, that is, running from the buccal and labial sides to the lingual sides. The tray should be well clear of the tissues at the throat ends for the maxilla or mandible, to embrace the area but not to touch it.

The tray, with the suitable quantity of plaster mixed rather thick and placed therein, should be carried without haste until it rests on the wax stops. Firm gentle pressure is then maintained with the fingers until it has set. The patient is directed to make his lips and cheeks comfortable but without any extensive movement and then to stop. It is important that the pressure is not relaxed for a moment, otherwise swallowing or other movement may produce tension and upset the balance.

When the impression has been removed, it is allowed to become quite dry. Any fractured pieces are waxed into position. It is then painted with shellac varnish which is thinned with spirit (surgical or industrial) so that no trace of a film is left on the impression. It is merely colored with it. We then box the impression with a strip of Britannia metal, No. 4 gauge, and secure it with wax run at suitable places externally and at the joining line. It is then slightly greased with a small brush over the gum surfaces. For this purpose we use petroleum, or other oil, with a trace of wax in it, which prevents the oil running into deep markings. This is done by carefully warming it until the wax melts, using a tin receptacle. We prefer to let the model stand for four to eight hours before taking it off, although it may be done sooner if necessary.

If in the first place the tray has had a smear of modeling compound applied to it, we place the set model into hot water, which facilitates removal of the tray.

With this method, the thickness of the plaster impression being greater than with the ordinary way, it may be objected that the difficulty of removal of the model will be greater. The following method will render this process an easy one. Place the model with impression into very hot water for a few minutes after removing the wax stops. The plastic impression appears to become somewhat brittle and fractures easily instead of chipping. As the stops are deep and touch the gum, we cut round the peripheral edges of the model to ensure their being free and then cut a furrow at right angles to the stops, then with a sharp knife we fracture the outer section off. This is repeated at each section of the wax stops. The lingual or the palatal portion may require two or three fractures to remove it, and dipping in hot water again if necessary. Having the original model in front of us will indicate where we are cutting.

THE DENTURE

Dentures can be vulcanized on the model and will be found to be very satisfactory. The vulcanite coming out in a very tough condition with no sign of softness such as we have seen with some special plasters which contain Portland cement. (Dentures were shown which had been flasked with solution plaster entirely for the whole of the molds.)

SUMMARY

1. Ordinary water plaster presents a porous mass which is rough and coarse; it also loses one-quarter of its weight roughly by dehydration.
2. The use of my solution exhibits different chemical and physical properties.
3. A closer form of substance is produced, of finer texture and much less porosity.
4. In impression taking, on account of its receptive plasticity, the use of ordinary "well type" trays with wax stops is desirable to secure centralized position and to eliminate tilting.
5. The tray must not touch the tissues at any point at the throat areas.
6. The process of vulcanization on solution plaster models is entirely satisfactory.
7. Dentures vulcanized on solution plaster models cast from solution plaster impressions are better suited to secure balanced seating when the unalterable fitting surface is placed in contact with the gums under masticating pressure.

A RATIONAL PLAN OF ORTHODONTIC TREATMENT WITH THE AID OF PRACTICAL RECORDS*

DR. GUSTAV KORKHAUS, BONN, GERMANY

THE great uncertainty with which we regard orthodontic treatment is only partially due to the choice and application of appliances. It must be solved chiefly by establishing a correct diagnosis and by determining in what direction the teeth should be moved in each case. The orthodontic diagnosis consists of an analysis and a synthesis. To explain the complexity of symptoms and to determine the facts of a case an analysis of the models and, which is even more important, of the profile photograph is necessary; and finally each separate deviation is added to another, thus forming through synthesis a definite pathologic state.

The analysis of the denture must be made according to a definite plan. It must disclose all the important details in systematic order. The same logical method of examination should always be followed: first, the maxilla; then the mandible; then the occlusion.

In all cases of neutroclusion and regular features, the examination can be limited to the analysis of the models. In cases of malocclusion the relationship of the jaws with the face must be determined; that means that the amount of sagittal deviation of each jaw must be ascertained. This can be done best and surest with a profile photograph. Other methods, such as the gnathostat, roentgenograms and anthropologic measurements, may be added advantageously.

After this diagnostic examination we are able to determine (1) the numerical completeness of the denture and the consequences of premature loss of teeth; (2) the deviations of each tooth or of groups of teeth in both jaws in transverse, sagittal and vertical direction; (3) the occlusion and its deviation; (4) the relation of the denture to the facial bony structure.

After this it is possible to make the diagnosis, i. e., to designate the present orthodontic anomalies according to our genetic classification which covers a few large groups of orthodontic anomalies, the origin of which science and research have been trying to determine for many years.

After these observations the questions have to be answered as to what end-result of treatment we are aiming, and by what movements of the teeth this can be attained. Unfortunately, the necessary interest in these points is often lacking in practice, although it is essential at the beginning of each treatment. The direction and the extent of force of the movements we intend to produce should be written down, but above all we should try to find out to what extent we can use the principle of combining forces, which will act at the same time. Nearly always, preparatory movements must be carried out first, as this will facilitate the function of other and more important ones. For instance, in protrusion or

*A demonstration given at the Second International Orthodontic Congress, London, July, 1931.

retrusion the elimination of a compression (frontal crowding) of the incisors must be considered as a preliminary requisite to the mesial displacement of the mandible. The date on which the several movements are to be brought into force must be fixed. According to our experiences these movements must be approximately fixed for their beginning and duration, so that they possibly will simplify the appliances and influence the anchorage in a favorable way.

As the biologic reaction always differs with each patient, nothing definite can be said, of course, at the beginning of the treatment in regard to the time for each movement. In considering this question, I have used the term a "degree of reaction." By this I mean *the time needed to move a tooth or a group of teeth one millimeter in a certain direction.*

The entire diagnostic examination and the drawing-up of a plan of treatment are facilitated by the use of a little notebook in which all questions and statements are found in print, so that only figures have to be entered or the printed indications have to be underlined. The drawing-up of the plan of treatment in all its details is facilitated by the columns in which the movements are noted according to order, direction, size and possible duration. Should it be proved in the course of the first three months of treatment that the assumed degree of reaction is not correct but that the biologic reactions of the bone are slower or quicker, then the notations (which for this reason should be made in pencil) could be changed.

In order to bring the course of the treatment under close observation, some pages have been provided with columns. All measures taken should be entered in the book, also the time used heretofore. The work by the orthodontist during the period of treatment is threefold. First of all it must *control* the course of tooth movement so far attained and must ascertain whether these movements have taken place in the time set aside for them, or if not, what have been the causes for the delay. The second part of this work is to apply the *new movements* at the time fixed. The third part of the orthodontist's work is of an unproductive nature, i. e., *the repairing and cleaning of the appliances.*

In regard to the construction of the appliance, it would be advisable to draw a sketch before beginning treatment, with all the details in different colors.

The use of such a notebook will facilitate the work of the orthodontist in the diagnosis and the procedure of treatment. All necessary parts of the plan of treatment, such as photographs, roentgenograms, curves, and also a note regarding the fee agreed upon or received, should be attached to the cover of the book.

SOME USEFUL INSTRUMENTS USED IN ORTHODONTIC PRACTICE*

SYDNEY W. BRADLEY, M.D.S., D.D.S., OTTAWA, ONTARIO, CANADA

FIG. 1.—Soldering pliers made by soldering round tungsten wire, gold plated, size .030 or .036 to G. Boley, Swiss made tweezers, size B.B. This type of tweezer is preferred because the spring is soft and responds to delicate pressure. The tungsten ends can be ground to very fine points, and these are not affected by intense heat, nor do they conduct the heat from the flame as much as do steel points.

Fig. 2.—Band soldering pliers. Tungsten wire .030 or .036 round and gold plated is bent to the required shape, then soldered to ordinary tweezers and cut midway between the ends soldered to the tweezers. The cut ends are stoned to butt accurately.

Fig. 3.—A pair of surgeon's artery forceps (mosquito forceps with curved beaks) used for holding bands and alignment wires when soldering. The positive grip and the locking device commend these. Dr. Ralph Waldron of Newark, New Jersey, gave me this idea years ago.

Fig. 4.—An S. S. White plier No. 114 (Dr. Johnson's) with the flat point grooved and the ball point trimmed, to shape the crimps in ribbon arch wire used in making Hawley retainers.

Fig. 5.—An S. S. White plier No. 114 (Dr. Johnson's) with the points trimmed for removing pins which are stuck in tubes.

Fig. 6.—A pair of contouring pliers designed by Dr. J. D. White and used for contracting alignment wires. This is especially useful with the pin and tube appliance.

Fig. 7.—A pair of Stubs pliers No. 17 with the beaks trimmed on the inner surfaces to form narrow ridges at the extreme points and used for squaring the pinched bends of incisor and premolar bands when drawing them to a snug fit before soldering, using No. 2 pliers. It may be necessary to burnish the joint opposite the pliers to improve the adaptation of the joint ends.

Fig. 8.—A pair of round nosed pliers, with very fine points used for making the bends or coils in auxiliary springs.

Fig. 9.—An ordinary round nosed plier with the points cut off about half way and used to open loops in labial alignment wires without removing them from the patient's teeth. Different sizes can be made by cutting the ends off at different distances from the points. Of course, compensating bends must be made at the base of the loop. Pliers No. 17 are used for this.

Figs. 10 and 11.—These pliers are used for placing mandibular lingual alignment wires and are especially good for this work. They are Nos. 50 and 51 made by the Blue Island Specialty Co.

Fig. 12.—Pliers No. 40 made by the Blue Island Specialty Co., with the points ground off slightly and grooves made to grip maxillary labial and lingual

*A demonstration given at the Second International Orthodontic Congress, London, July, 1931.

alignment wires at the joint of the pin and wire, for insertion into the half-round tubes on molar bands.

Fig. 13.—S. S. White pliers No. 110 with the round part of the nose on the side of the pliers ground off a little and a slot cut parallel to the part ground off each beak. They are used for placing maxillary and mandibular labial and lingual alignment wires.

Fig. 14.—Blue Island Specialty Co. pliers No. 10 used for pinching bands on maxillary and mandibular incisors when the pinch is made on the lingual surface of the tooth.

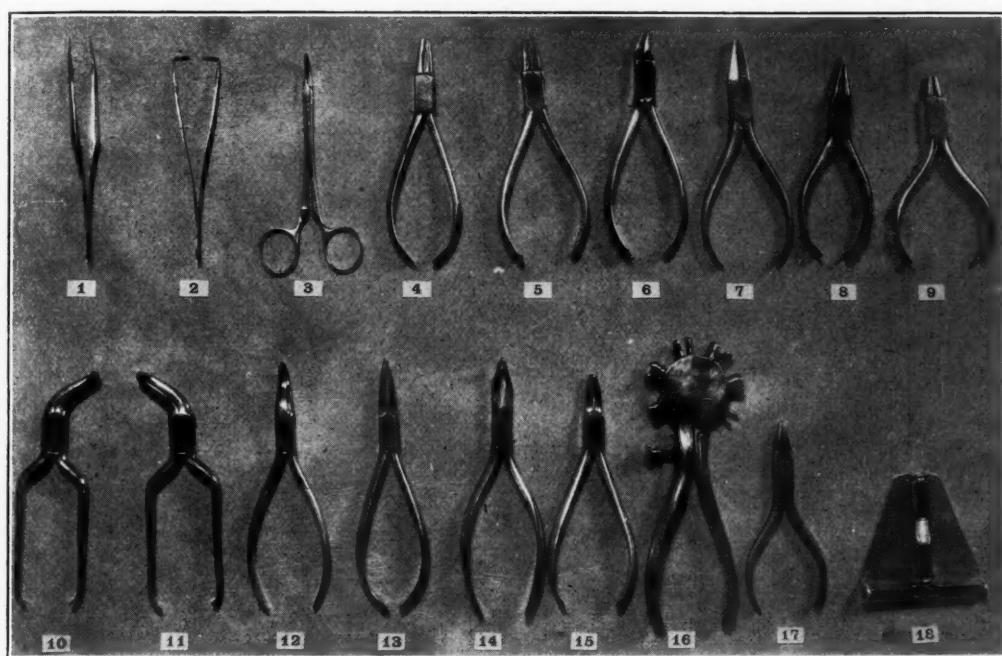


Fig. 15.—S. S. White pliers No. 114 with the ends ground off slightly. They are used for drawing in the incisal and gingival edges when fitting molar or premolar bands. Dr. Mershon of Philadelphia showed me how to make these pliers.

Fig. 16.—A pair of crown fitting pliers made by the Kosmos Dental Gesellschaft, Berlin, with the ball points machined and ground to stretch and contour incisor, premolar and molar bands.

Fig. 17.—A pair of Stubs pliers No. 8 with the beaks bevelled to a width of three thirty-seconds of an inch and grooves made parallel to the ends of the beaks. I use these pliers more than any others in my daily work.

Fig. 18.—A two way level used in model making. It is very useful.

AN IMPROVED LINGUAL LOCK*

A. EDEL, AMSTERDAM, HOLLAND

THIS improved lingual lock gives great stability and is simple to use. Instead of the half-round tube of the Mershon lock, which allows too much play after it is used for a certain length of time, there are two improved round tubes, the same as in the Korkhaus lock.

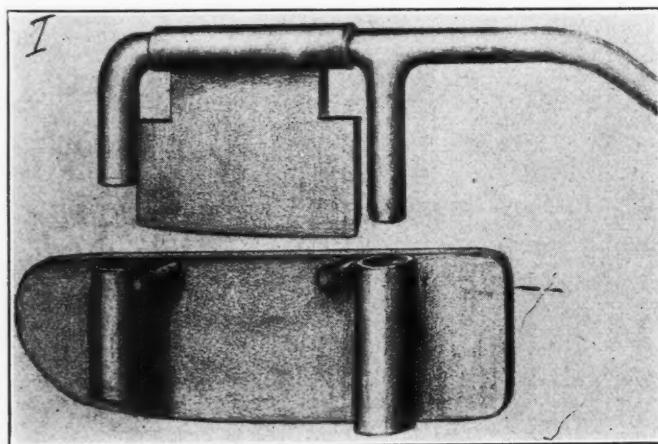


Fig. 1.

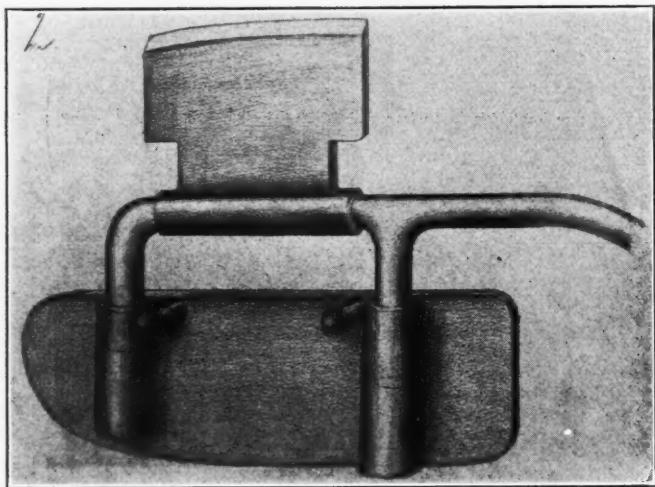


Fig. 2.

The latter, however, requires the two tubes to be as long as possible, because the connection of the apparatus, viz., the movable lap with the hole in the center, surrounding a small knob, does not give enough strength.

I have tried to give the whole of this new lock more strength. The bar

*Paper presented before the Second International Orthodontic Congress, London, July, 1931.

fits into the two tubes and ends in two rods. Between the two tubes is a movable slab which fits very accurately, and when the slab is pushed slightly, it locks itself between the two tubes (Figs. 1 and 2).

There are two knobs on the lower plate to hold the bar in place.

This construction makes it possible to have the mesial and distal tubes as short as possible, which is a valuable feature for use on mandibular molars.

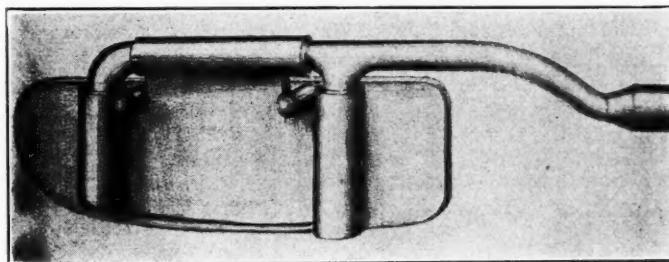


Fig. 3.

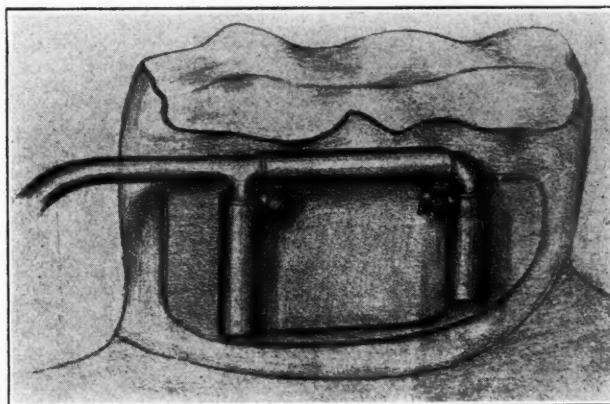


Fig. 4.

This lock can be made very small, and therefore it is suitable for deciduous molars. It can be easily opened with a spoon excavator.

The lock is so constructed as to be perfectly smooth and is not annoying to the patient's tongue. It is made, like the Korkhaus lock, on a plate, and can be soldered to the molar band. The end of the bar is a small tube, which is soldered to the main lingual bar (Figs. 3 and 4).

DEPARTMENT OF ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

Sterling V. Mead, D.D.S., Washington, D.C., Director

M. N. Federspiel, D.D.S., M.D., F.A.C.S., Milwaukee.—Vilray P. Blair, M.D., F.A.C.S., St. Louis, Mo.—Theodor Blum, D.D.S., M.D., F.A.C.D., New York.—Leroy M. S. Miner, M.D., D.M.D., Boston.—Wm. L. Shearer, M.D., D.D.S., Omaha.—Frederick F. Molt, D.D.S., Chicago.—Robert H. Ivy, M.D., D.D.S., Philadelphia.—Edward L. Miloslavich, M.D., Milwaukee.—French K. Hansel, M.D., M.S., St. Louis, Mo.—W. M. Reppeto, D.D.S., Dallas, Texas.—Leo Winter, D.D.S., New York.—Walter O. Faught, D.D.S., Nashville.

THE FEEDING OF A LIQUID DIET*

JAMES BARRETT BROWN, M.D., F.A.C.S., ST. LOUIS, MO.

THE following outlined liquid diet may be used as a standard twenty-four hour ration (1) in patients with the jaws wired (open or closed), (2) in patients with feeding tubes through the nostril in the stomach, and (3) in other patients to whom solid food cannot be given. The continued use of the diet makes it possible to keep these patients up to normal weight and allows a full diet to be resumed rapidly after an operation or after wiring fractured jaws.

An average diet for twenty-four hours for a person weighing 150 pounds doing average work should supply about 2500 calories divided roughly, as follows:

Protein	125 gm.	500 calories
Fat	100 gm.	900 calories
Carbohydrates	300 gm.	1200 calories
Total		2600 calories

An average liquid diet should be calculated to approach the above in balance, or the tendency will be to supply an overabundance of carbohydrates.

The following balance might be taken as an approach to normal:

Protein	75 gm.	300 calories
Fat	100 gm.	900 calories
Carbohydrates	350 gm.	1400 calories
Total		2600 calories

Preparation of Diet.—These ingredients should be gotten together once a day and should be prepared as nicely and as appetizingly as possible. Many attractive things can be made, and flavors, chocolate, fruit juices, coffee, tea, ice-cream, etc., can be added as desired.

Give the juice of at least two oranges or lemons daily, and give water to make total fluids at least 3000 c.c. per twenty-four hours.

* From the Surgical Service of Dr. V. P. Blair, Washington University School of Medicine and the Oral Surgical Clinic, Washington University School of Dentistry, St. Louis, Mo.

ROUTINE LIQUID DIET, TWENTY-FOUR-HOUR RATION FOR AN AVERAGE ADULT *

	OZ.	C.C.	PROTEIN	FAT	CARBO- HYDRATES	APPROXIMATE CALORIES
6 Eggs	6	180	36 gm.	30 gm.		450
Cream, 20%	8	240	8 gm.	48 gm.	8 gm.	480
Milk	24	720	24 gm.	24 gm.	48 gm.	480
Tomatoes, strained, canned	6	180	3 gm.		6 gm.	36
Glucose, sugar or syrup	10	300			300 gm.	1200
Salt, 1 teaspoon						
	54	1620	71 gm.	102 gm.	362 gm.	2646

*Care should always be taken that this diet is not given to a patient with diabetes.

Fresh beef juice is thought by many to be of value, and a simple method of preparation is, as follows: Take 8 ounces of lean, ground beef and soak in 8 ounces of water overnight—covered in an ice box—strain in the morning and add the juice to the diet, as it is or as a soup or consommé. Perhaps much better would be the daily use of 4 to 6 ounces of lean scraped beef.

Variations of diet are extremely important, and this part of it after all must be looked after by the patient or his caretaker. The basic diet should be followed, however, and one should not allow too many days to go by with large portions of it left unused. Additional foods may be added as desired and elements of corresponding caloric value eliminated from the basic ration. We have not found much success in suggesting certain foods for certain meals because of wide personal variations in tastes, but prefer to prescribe this list of staples and allow preparation of it as desired.

EXTRA FOODS

	CAL. PER OZ.	PROTEIN	FAT	CARBOHYDRATES PER OZ.
Milk	20	1 3.5%	1 4%	2 gm. 4.5%
Cream 20%	60	1	6	1
Eggs (1 per oz.)	75	6	5	
Beef loin, cooked	60	8	3	
Karo	120			30
Dryeo	125			
Oatmeal	110	5	2	20
Potato	25	1	0	6
Bread	90	3		18
Rice	110	3		24
Butter	240		25	
Orange (1)	40			10
Vegetables 5%	6	0.5		1

FRACTURED JAWS

We have never found it necessary to remove any teeth to feed patients when the teeth are wired together. Space for liquid to pass is usually found in one or more places—(1) between the occlusal surfaces, (2) through empty sockets, and (3) behind the last teeth. If it seemed possible to get enough food in, we resorted to the use of a tube through the nostril into the stomach, or to an open method of fixation rather than to remove a solid tooth. The practice of slipping a wedge between the teeth on one side to allow for passage of food in an otherwise closed fixation is mentioned here only to condemn it.

Most patients present some difficulty mainly in swallowing for a few days, but, when they have gotten up and around, have little further trouble except, of course, to complain of the monotony of liquid food.

THE USE OF FEEDING TUBES

It may be necessary to pass a feeding tube through the nostril into the stomach to get food and fluid into some patients, for example, in cases of (1) severe injury, (2) infections about the mouth or pharynx, and (3) tumors about the mouth or pharynx, pre- or postoperative.

Passage of the Tube.—A simple soft rubber catheter, Nos. 14 to 16, will do, or an Andrews stomach tube—which is simply a long catheter—may be used. An

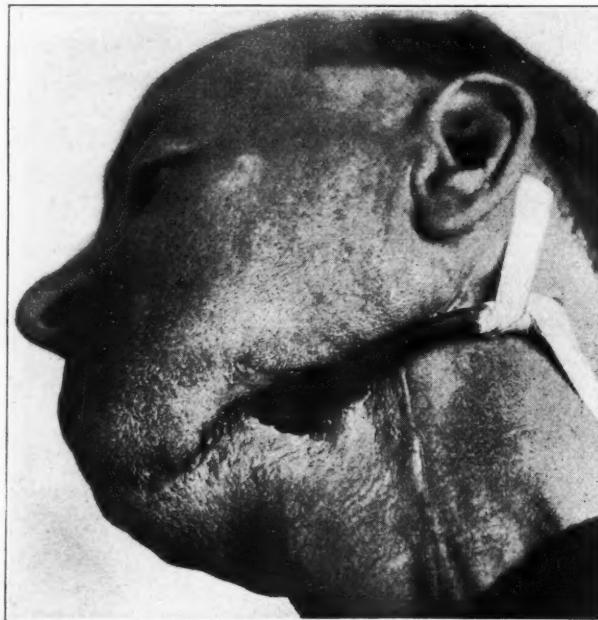


Fig. 1.—Use of catheter through oral fistula. Patient with oral fistula following complete resection of tongue and glands of neck for carcinoma. The tube was brought through the fistula, and the patient was able to be up and around, and to feed himself over a period of several weeks. The fistula was closed later, and the patient could then take a very liberal diet.

endeavor is made to determine which nostril is the most open, and, if necessary, it may be cocainized.

The tube is greased and permitted to slide gently through the inferior meatus until it touches the posterior pharyngeal wall. With a little more pressure, it kinks down into the pharynx. There may be some gagging, but deep inspiration and a real attempt at swallowing will usually overcome the difficulty, and, with only a little force, the tube may be gotten down the esophagus.

The tube should be firmly anchored to the face with adhesive plaster at all times to prevent the patient from swallowing it.

Always put sterile water through the tube as soon as it has been introduced to be sure it is not in the trachea; 4 to 6 c.c. of water are enough; if the tube happens to be in the trachea, this much will produce violent coughing without doing much harm, but if a whole syringe full of a liquid diet were shot down

the tube, the patient would probably die immediately. If there is no cough or distress, the tube is probably in the esophagus.

A clean cork or piece of a lead pencil or other wooden peg should be kept in the tube to prevent regurgitation each time the patient coughs or moves around in bed.

Change the tube, if practical, from one side to the other about once a week, and if there is ever any ulceration caused by the tube.

Mouth washes and nose oil drops should be used regularly for most patients, whose comfort and cleanliness will be helped in any way by their use. Order tooth brushes for all patients who present themselves without them and get the mouth cleaned quickly and have it kept clean.

Bowels should be checked up each day.

TUBE FEEDING MIXTURE

This liquid diet is the same as already listed. Even though it is given through a tube, it is best to fix the various ingredients into appetizing drinks, soups, etc.

However, to simplify the procedure so that the patient will be sure to get his full ration, all the ingredients may be mixed together and given in five or six separate feedings.

The fluids should be given with a syringe at a swallowing rate, and, preferably, slightly warmed. The extra fruit juice, coffee, tea, etc., may be given as desired.

The tube should be washed out with water after each feeding.

ULCEROMEMBRANOUS STOMATITIS

STERLING V. MEAD, D.D.S., WASHINGTON, D. C.

ULCEROMEMBRANOUS stomatitis is an infectious and contagious disease of the mouth which attacks the gingivae, tongue, cheeks, buccal mucosa, the throat and tonsils, and produces characteristic ulceration in which a spirillum and a fusiform bacillus are present.

NOMENCLATURE

Ulceromembranous gingivitis is a term suggested by Grieves. It is known by other terms, such as acute ulcerative gingivitis (as described by Dr. Thomas L. Gilmer,¹ and at his suggestion and from material furnished by him, Dr. Tunnicliff cultured, anaerobically, the organisms discovered and described by Vincent and Plaut, thus demonstrating them as the cause of this disease), acute ulcerous gingivitis, trench mouth, and Vincent's angina. The term Vincent's angina, however, is usually understood to mean the manifestation of a more serious form of this disease in the tonsils and throat.

The disease is very generally known as Vincent's disease or trench mouth. Box speaks of it as necrotic gingivitis. The stomatitis is erroneously called Vincent's angina by many. It has been described by various writers as phagedenic gingivitis, Plaut-Vincent's stomatitis, fuso-spirillary periodontal gingivitis, putrid stomatitis, putrid sore mouth, acute septic gingivitis, pseudomembranous angina, etc.

ETIOLOGY

Ulceromembranous stomatitis is most frequently found in ill-kept mouths where sufficient care has not been exercised in cleaning the teeth, although its contagious and infectious character renders mouths with only slight gingival irritation particularly susceptible to attack through direct contamination with the specific organisms. The contagiousness of the disease was well illustrated by its occurrence in the mouths of large groups of men during the war.

It is generally conceded that the causative organisms of ulceromembranous gingivitis (Vincent's disease) are the *Bacillus fusiformis* and the spirillum (*Borrelia vincenti*) of Vincent and Plaut. The constant appearance of these organisms in lesions of ulceromembranous gingivitis, and their disappearance upon treatment, have led to the belief that they are the bacteriologic etiologic factor in the disease.

While this disease is found mostly in unclean mouths, still it does occur in mouths with only slight gingival irritation.

Among the factors which may be concerned in the susceptibility of a person to this infection are dietary deficiencies, wasting disease, fatigue, unhygienic care of the mouth, smoking, trauma, etc.

The disease may be contracted through food, utensils, dishes, drinking glass or cup, kissing, or by any means of salivary contact. The specific organisms

isolated from these ulcers are fusiform bacilli and Vincent's spirochetes. The organisms are of the anaerobic type, thriving best in the absence of oxygen.

These germs are, of course, associated with other forms of mouth organisms, such as those of the pyogenic group, and any involvement within the mouth is therefore a mixed infection. Positive identification of the fusiform bacilli and Vincent's spirochetes is made by staining a smear upon a glass slide, and examining it under the microscope.

These germs may be found even in healthy mouths, and the virulence of the organisms, therefore, depends upon environment. The most severe symptoms are those associated with the involvement of deep pockets and flaps of tissue over unerupted and impacted teeth. There may be local pain even when the disturbance is due to a slight gingival pocket. If a tooth is extracted, or a new field of tissue is opened up to the invasion of the infection, there is immediately developed a more serious form of disturbance and a more virulent strain of organisms.



Fig. 1.—*Ulceromembranous stomatitis (Vincent's).*

The fusiform bacillus and Vincent's spirochete are often associated with the most destructive and fatal forms of disease, such as gangrenous stomatitis and necrosis.

The primary factor causing this disease is often overlooked when the acute stage responds readily to treatment and the patient is dismissed, but returns at some future time with a recurrence of the disease. After this has happened one or more times, the doctor begins to become suspicious and searches for a primary factor. After the acute stage has subsided, the patient should be subjected to a thorough physical check-up. Particular attention should be given to the blood picture and any irregularities corrected which will tend to build up a normal blood condition. If there are any dietary deficiencies, as shown by the blood calcium or examination of the urine for calcium, phosphorus, sugar, albumin, etc., this should be corrected. The necessary vitamins should be supplied, and the patient should be put upon as normal a diet as is practical. Plenty of orange juice and citrus fruits should be given. The intestinal tract should be given careful consideration, and if there are any irregularities, they should be corrected. I have found many cases that recurred as a result of infected tonsils and which have been cleared up by their removal. The sinuses are often the initial focal point for lowering the general resistance of the patient, making

him more susceptible to the action of these organisms in the mouth. In fact, any focal infection or any general condition which lowers the patient's general resistance has a bearing on the growth of these organisms in the mouth and on the inception of this disease. In patients with lowered resistance many times insignificant areas, such as the irritation of the gingival tissues by a gold crown or by the facing of a bridge, are sufficient to cause an exacerbation of this disease. The most frequent cause is the infected pericoronal area around unerupted third molars.

In many cases a hidden periodontal pocket, which will be shown up by the roentgenogram, or a periapical infection may be the etiologic factor that tends to cause a recurrence of the disease by lowering the patient's general resistance.

BACTERIOLOGY

Bergey classifies the causative organisms of ulceromembranous gingivitis as *Borrelia vincenti* and *Fusiformis dentium*. These are the organisms described by Vincent and Plaut, and are the terminology accepted by the Society of American Bacteriologists.

There are three varieties of spirilla found in the mouth: the true Vincent's spirillum, or *Borrelia vincenti*, the *Treponema microdentium*, and the *Treponema macrodentium*.

The *Bacillus fusiformis* (*Fusiformis dentium*) is a straight or slightly curved rod, which appears to be pointed, and is thicker at its middle than at its ends. At times a single transverse, colorless band is demonstrable at the center of the bacillus, or it may appear beaded, due to the presence of granules. It is anaerobic and saprophytic. It is nonmotile, nonsporulating, and stains readily with 25 per cent carbolfuchsin and with the basic dyes as well, but not with the Gram stain. There are many morphologic forms of the *Bacillus fusiformis*, which may range from delicate threads (claimed by some bacteriologists to be chains of bacilli) to S-shaped types, which are said to be formed by two curved bacilli lying end to end.

In the dark-field illumination of smears from ulceromembranous stomatitis lesions, the fusiform bacillus is found to be nonmotile.

Granules are found in the fusiform bacilli which are thought by some workers to be spores. They stain darker than the bacilli and often give the organism the appearance of stippling or banding. It has been suggested that the spirilla make up another stage in the life cycle of the bacilli and that the granules are the germinal centers of the spirilla.

Borrelia vincenti under the dark-field microscope moves about with a rotary lashing motion as opposed to the corkscrew-like undulation of the *Spirocheta pallida* of syphilis. It stains slightly with the basic dyes. It is gram-negative. The *Borrelia vincenti* is larger than the *Spirocheta pallida*, and is decidedly quicker in the dark-field illumination smears. The *Borrelia vincenti* is more motile than are the other two varieties, and Cobe and Grace state that acute flare-ups of ulceromembranous stomatitis always yield a more motile spirillum than is found in the mouths of those not showing a positive clinical picture.

In 1905 Dr. T. B. von Beust reported a new concept of the bacteriology of Vincent's organism, claiming that the causative agent was a mold, and that

the fusiform bacillus was not in reality a bacillus, but only mistaken for one; that it is a spore of a higher fungus, called *Leptothrix falciformis*. He found with specially stained preparations (iron-alum-hematoxylin) that the spores were identical with the fusiform bacilli, and, as spores, attached to the mycelia in characteristic fashion.

Culture.—The isolation and cultivation of these organisms were first reported by Tunnieliff in 1906. Krumweide, in 1913, reported isolating and cultivating the fusiform bacilli in pure culture. Cobe and Grace have been able to grow them, but have been able to grow the fusiform bacilli only from acute cases.

Varney has shown that a pure culture of fusiform bacilli is odorless. This adds to the belief that ulceromembranous stomatitis is due to a symbiotic action of two organisms.

Varney found that the best cultural medium for the growth of fusiform bacillus was blood agar. He incubated the organisms on this medium in anaerobic jars containing phosphorus for forty-eight hours.

Muhlens and Hartmann claim that they have grown these organisms in pure culture.

The causative organisms are found in most mouths but appear to be present in a saprophytic form. Lowered local resistance and certain systemic factors may change these organisms from harmless to pathogenic ones.

Direct Smear Examination.—Direct smear examination from the necrotic tissue is the most practical and useful plan of examination. The material is obtained upon a platinum loop and smeared over a glass slide. This is allowed to dry and is then fixed over the flame. Both these organisms stain readily with the aniline dyes, but the fusiform bacillus stains darker. A dilute carbolfuchsin stain or Loeffler's methylene blue may be used. Cobe and Grace used a 2 per cent solution of methyl violet.

The slide may then be examined under the oil-immersion lens. For viewing the organisms in motion, the oil-immersion lens of the dark-field microscope may be used as follows:

Place a drop of oil on the dark-field condenser, place slide on the stage over the condenser, raise the condenser until the drop of oil touches the bottom of slide; then place a drop of oil on top of the slide and lower the objective until the objective touches the oil.

The presence of large numbers of both the *Borrelia vincenti* and *Fusiform dentium* in the same field is bacteriologic diagnostic proof of ulceromembranous stomatitis, but this should coincide with the clinical examination.

INCIDENCE OF INFECTION

Daley in an examination of 3,771 cases as they appeared in the dental school clinic, found 602 positive cases out of 1,843 in the year 1927; 423 positive cases out of 1,275 examined in 1928; and 211 positive cases out of 653 examined in 1929.

Marked throat symptoms averaged about 16 per cent of the cases examined during the three years.

He concludes:

"1. Vincent's infection is most common in individuals between the ages of twenty and fifty.

"2. The most susceptible period among females is between the ages of twenty and thirty.

"3. The most susceptible period among males is between the ages of thirty and forty.

"4. Vincent's infection is more prevalent the first three or four months of the year than it is during the last three or four months. The average incidence for the first three months of the year is higher than the general average for the year. The average incidence for the last three months of the year is lower than the general average for the year.

"5. Vincent's infection is more prevalent among native born than among the foreign born.

"Vincent's infection is more common among individuals having occupation of a sedentary nature."

Wright, of the Public Health Service, states:

"We examined 265 smears taken from boys ranging in age from five to twenty-one who were pupils in a private boarding school. Of this number, 22 per cent showed positive smears, but no pupil had lesions or other symptoms of Vincent's infection other than the presence of the organisms. There had been one active case of the infection during the entire school year, a case which was sent to a hospital for treatment.

"These positive smears were not confined to any age group, but were distributed over all ages, with more between the ages of eleven and eighteen. The mouths of the great majority of these boys were in excellent condition. They showed that they had had regular and efficient care, both by the dentist and at home.

"In 731 routine smears taken from patients in the United States Marine Hospital, Baltimore, we found 83 per cent to be positive even though only a small proportion of patients have active cases of Vincent's infection. Probably, this large percentage of positive smears was due to the type of men examined, as the majority were seafaring men who, as a rule, take little, if any, care of their mouths.

"These positive smears were taken from men ranging in age from sixteen to sixty-five, but the great majority were under forty. It is interesting to note that one patient with a positive smear was fifty-five and was wearing a full upper and lower denture.

"In our experience we find the difference between a positive smear and an active positive smear to be in the appearance of the fusiform bacilli. In a positive smear, both organisms are present, and the fusiform bacilli stain uniformly with the gentian violet stain. In an active positive smear, both organisms are present, and some of the fusiform bacilli take a metachromatic or beaded appearance under the microscope when 2 per cent gentian violet stain is used. We have found this beaded-appearing organism always present in smears of either acute or chronic infections, although it is present in greater numbers in the acute cases."

Cobe and Grace state that the stage of the disease can be told by the type of

organism present. They state that in the acute stages *Bacillus fusiformis* predominates, and that in the old chronic cases and the treated cases there is a tendency for the bacilli to disappear or lessen, leaving only the spirilla. They further state that a study of 1,500 mouths in the regular routine of three independent observers showed that in 86 per cent of all smears taken, both fusiform bacilli and spirilla in definite amounts were found, and that in 49 per cent of these positive cases there were no clinical symptoms. Lufkin and Disraeli made smears from over 1,000 cases taken at random. In mouths showing no clinical symptoms they obtained 48 per cent positive smears, and in mouths showing clinical symptoms they obtained 98 per cent positive smears.

Stafne found that these two organisms were present in 57 per cent of adult mouths where there were no clinical symptoms of ulceromembranous stomatitis, and that spirochetes were present in 100 per cent of patients.

LOCATION

This disease is most frequently found in the mouths of young people between the ages of sixteen and twenty-five, although age is no barrier and it may appear in the very young and very old. A common form is one in which it is distributed throughout the mouth, involving the gingivae and surrounding most, if not all, of the teeth; but it may appear around a single tooth. It often appears in the region of a partially erupted third molar under the flap of gum tissue, and there are instances of its occurrence unilaterally involving a number of teeth. The usual location is the gingiyobuccal border of any tooth and especially that of the first and third molars.

In the early period of infection, small superficial grayish-white patches may appear on the mucous membrane of the cheek or tongue. When these are removed, there remains a raw, bleeding, extremely sensitive surface.

OBJECTIVE SYMPTOMS. ACUTE STAGE

Lesion.—This disease is characterized by the appearance of a sensitive and very painful superficial ulcer, which is of an irregular shape and is covered by a whitish-gray membrane that is easily removed. The initial lesion may occur as a general infection of the oral cavity on the lip, cheek, tongue, or buccal mucosa; as an infection of the gingivae, or as an infection of the tonsils or throat.

The lesion upon the lip, cheek, tongue, or buccal mucosa is likely to be very atypical.

The lesion upon the gums or gingivae is the condition most often seen. The yellowish or grayish-white ulcer may be found at the gingival border of one tooth or may extend around the entire area. It may be wiped off easily and leaves a cup-shaped, bright red depression, which bleeds easily. The ulcer or necrotic tissue appears early in the disease, and it is usually present when the patient consults his dentist, but there is an early period in the disease before the ulceration appears, at which time the gingivae stand away from the tooth and are boggy, with a red inflamed gingival line which bleeds easily. This period may last only from twelve to twenty-four hours.

The infection of the tonsils or in the throat is termed Vincent's angina. In the beginning it is characterized by a small lesion similar to that seen in the

mouth. The disease in the throat progresses rapidly and when first seen usually has a pseudomembrane covering quite a large area. The ulceration is usually superficial but may be deep seated.

Sudden Onset.—The onset of the disease is sudden, and a severe stomatitis may develop within twenty-four hours.

Bleeding.—The area under the ulceration bleeds easily after removing the necrotic tissue.

Saliva.—The saliva is thick and viscid or ropy in character. There is also an increased flow of the saliva.

Fetor of Breath.—The breath becomes foul and there is a very characteristic putrid odor. This, however, is likely to be due to a mixed infection.

Coating of Tongue.—A whitish or yellowish coating of the tongue is usually present, but this, of course, is not diagnostic per se.

Fever.—In the majority of the cases of Vincent's disease the temperature is usually between 99° F. and 101° F., indicating a mild febrile condition. In severe cases, however, it rises as high as 103° F. or 104° F.

Cervical and Submaxillary Adenopathy.—The submaxillary lymph nodes are enlarged and painful, but never suppurative. In severe or untreated cases this condition may also be discovered as affecting the cervical nodes.

Pulse Rate.—Pulse rate is slightly accelerated.

SUBJECTIVE SYMPTOMS. ACUTE STAGE

Pain.—The pain is so severe as to cause the patient to discontinue brushing the teeth and masticating his food. The pain is especially severe at night when the patient tries to sleep.

Difficulty in Swallowing.—The patient experiences particular difficulty in swallowing, and this is especially marked in the angina type.

Taste.—The patient often complains of a disagreeable or metallic taste.

CHRONIC STAGE

After the acute stage has subsided, there may remain the typical punched-out lesions on the buccal and lingual surfaces of the interproximal gingiva, giving a cupped-out or dished-out depression which is very resistant to treatment. These areas bleed easily but the symptoms are not so severe as in the acute stage. There is a very close relationship between these areas of chronic ulceromembranous gingivitis and chronic periodontal diseases, and the differential diagnosis is made upon the pathologic findings.

In the acute stage pus does not appear, except through mixed infection of the pyogenic group of bacteria. Fusiform bacilli and the *Borrelia vincenti*, which have become a less virulent strain, are often present in the chronic form of periodontal disease; and where these organisms predominate, the disease may then be considered as a chronic form of Vincent's ulcerative gingivitis. Grieves calls attention to this form of disease and to its likeness to other periodontal affections.

In chronic ulceromembranous gingivitis the patients will usually give a history of Vincent's infection having been present a year or more previously. These cases do not respond well to the usual treatment for periodontoclasia.

GENERAL SYMPTOMS

The general symptoms are malaise, increased mental depression, restlessness, or uneasiness, and there are occasional gastric disturbances, such as acidity and vomiting. This disease is occasionally accompanied by exanthematous eruptions resembling measles; these eruptions may accompany any of the acute mouth infections. The eruption is in the nature of an erythema. The leucocyte count is usually below 10,000 as compared to a high count in pyogenic infections, such as tonsillitis.

DIAGNOSIS

The characteristic lesion is a painful, superficial, irregularly-shaped ulcer, covered with a yellowish, whitish-gray membrane accompanied by febrile symptoms. The membrane is easily removed, causing instant bleeding. The diagnosis is made from the appearance of the tissues, from the microscopic appearance, and from the objective and subjective symptoms.

DIFFERENTIAL DIAGNOSIS

While ulceromembranous gingivitis is primarily a necrotic or pseudomembranous disease associated with gingivitis and periodontoclasia, it is differentiated from other periodontal diseases as follows:

*Ulceromembranous Gingivitis**Other Periodontal Diseases*
(Gingivitis, Periodontoclasia, Etc.)

Usually a disease of young persons.

Usually a disease of middle-aged and old persons.

Onset sudden.

Onset usually slow.

Patient aware of onset.

Patient unaware of onset.

Very painful.

Usually not painful.

Characteristic superficial ulceration.

No ulceration.

Usually swollen glands.

Usually no swelling in glands.

Pronounced systemic disturbances, such as fever.

Slight systemic disturbances. No fever.

Ulceromembranous gingivitis is frequently mistaken for periodontal diseases and at times for syphilis or other infectious diseases. Young persons often are very apprehensive, fearing they have a syphilitic condition. They often require reassurance regarding the nature of the disease. It is often associated with other disturbances in the fauces and tonsils. In the fauces and tonsils the disease is called ulceromembranous angina, caneriform or diphtheroid angina, but it is best known as Vincent's angina in this region.

The use of the microscope and serologic tests are necessary in making the differential diagnosis.

Chronic Vincent's disease of the gums and some cases of periodontal diseases are extremely difficult to differentiate. With all the symptoms of a Vincent's disease superimposed upon those of a true periodontoclasia a complex condition arises which requires treatment intended to combat the symptoms of both infections.

Streptococci stomatitis is a gingivitis caused by streptococcal infection and characterized by evidence of acute or chronic infection. In many instances typical cases of this disease have been diagnosed as ulceromembranous stomatitis (Vincent's) by both the medical and the dental professions.

This type of stomatitis may follow a streptococcal sore throat or severe cold but may also occur as a result of poor mouth hygiene in a patient with a lowered resistance, particularly a patient with a diet deficiency. It may follow a tooth infection, especially where there has been an acute flare-up.

This disease usually begins with a gingivitis about two or more teeth and may spread around the entire ridge and involve all of the maxillary and mandibular teeth. In the more severe acute type of cases the gingivae are hypertrophied, congested, bleed easily, and are painful. Ulceration does not accompany these symptoms.

The tissues are a cherry-red color, particularly the gums, and marked sloughing is unusual. There may or may not be a discharge of pus from the gum margins. There is usually considerable pain and more or less neck involvement. In the milder or chronic cases the gums remain reddened, bleed easily, and are tender.

Smears taken from the crest of the gingiva show the presence of green hemolytic streptococcus, or *Streptococcus viridans* predominating, with staphylococci and other mouth organisms. The history of a sore throat or a cold in the presence of the definite picture of this disease is very significant.

Syphilis may be differentiated from ulceromembranous stomatitis by serologic test and a dark-field examination which will show the ten to twenty-spiralled *Treponema pallidum*. Clinically, the chancre is usually distinguishable from the typical ulceration of ulceromembranous stomatitis, but not always in the early lesions. The serologic reaction is negative in uncomplicated cases of ulceromembranous stomatitis, although this is questioned by some. The presence or absence of painful tender lymph glands may be considered of importance in the differentiating diagnosis. In syphilis the lymph glands are also enlarged but are nonsuppurative; they are not painful and tender unless complicated by pyogenic infection, while in ulceromembranous stomatitis they are painful.

In examining smears from either the pseudomembrane or the ulcers the *B. diphtheriae* may be encountered, necessitating a differential diagnosis of diphtheria. In Vincent's angina of the palate and tonsils, some diphtheria bacilli will always be found. The slides should be stained with the Gram and Neisser stains. Diphtheria bacillus is gram-positive, while the fusiform bacillus is gram-negative. Moreover, the morphologic differences which are brought out by the Neisser stain and presence of the associated spirochete in the case of Vincent's disease serve to facilitate the proper diagnosis. In regard to the clinical appearance of diphtheria, it will be found that the diphtheritic pseudomembrane is tougher and harder to remove, having a tendency to tear away rather than to lift away, as is the case in Vincent's disease. The absence of severe constitutional disturbance in the latter infection has been commented upon as contrasted with the marked systemic reaction observable in diphtheria. The diphtheritic patient experiences less difficulty in swallowing and, when cervical adenopathy is present, complains less of tenderness of the glands. In the later stages of diphtheria there is great trouble in breathing.

A true Vincent's disease will be accompanied by large numbers of spirochetes as contrasted with the incidental spirochetes in diphtheria.

Morphologically, the diphtheria bacillus may be distinguished from the

fusiform bacillus by the fact that the ends of the former are club-shaped, while those of the latter are pointed.

Under the Neisser stain, distinct polar bodies are demonstrable in the diphtheria bacillus, but none can be seen in the fusiform bacillus.

PROGNOSIS

The prognosis of ulceromembranous gingivitis is favorable, and prompt recovery is made where early and proper treatment is instituted. The prognosis becomes more unfavorable where there is an involvement of the throat in Vincent's angina, and the consequences are very serious in the faucial and tonsillar form of the disease where prompt and proper treatment are not applied. Debilitated patients respond less quickly to treatment.

TREATMENT

The treatment of ulceromembranous stomatitis is divided into three stages; namely, the treatment of the acute stage, the elimination of the secondary factors, and finally the elimination of the primary etiologic factors.

All surgical procedure is to be deferred until the acute condition subsides, when the teeth may be partially scaled, gums surgically treated, and cavities filled. All irritation, however, should be eliminated. A thorough sealing should be deferred until a later date. Often in those cases where the gums are very sore, very large pieces of calculus may be removed from the teeth and gums, so that the drug used in treatment may reach the tissues. This should be done carefully, without traumatism of the tissues. Extractions and other surgical work should be postponed until all signs of the disease have disappeared. If the gums are extremely painful and the patient is nervous, high strung, and hard to treat, relief may be given by use of a solution of bicarbonate of soda in a glass surrounded by ice or ice water. Small pieces of gauze may be wrung out in this solution and placed over the gum surfaces and allowed to remain about five minutes, then changed. Other remedies can be instituted later, as the patient will then cooperate better.

Extreme hygienic measures should be pursued and persistency in treatment is most important. Local treatment by the dentist should be given two or three times daily in bad cases, and the patient should continuously care for the mouth. The mouth should be thoroughly cleaned by swabbing around each tooth carefully and persistently with pledgets of cotton that have been dipped in hydrogen peroxide. The mouth and the teeth should be sprayed and thoroughly cleaned, the gums dried, and some good antiseptic applied. The bacteria are liable to become immune to any drug used continuously and, too, many persons react differently to different drugs.

A grouping or classification of the drugs that have been used in the treatment of Vincent's infection is as follows:

1. Specifics and bactericidals.
2. Caustics.
3. Oxygen-liberating compounds.
4. Alkalies.

Of the specifics, I believe hydrogen peroxide is the most useful, and it may be used full strength in its ordinary form on pledges of cotton to clean the gums, or as a spray, or as a mouth wash. It may also be used in connection with other drugs as a mouth wash. It is a safe procedure to use hydrogen peroxide freely in the treatment of the gums during an acute stage and, after the gums have been carefully gone over with pledges of cotton dipped in peroxide, an effective way is to spray in between the teeth with a spray bottle containing equal portions of peroxide and water in order to get rid of the debris and broken down tissue residue. When the gums are extremely sore, the spray may be used first, followed by other remedies.

The dyes are very effective in the control of this disease. Mercurochrome may be used in from 3 to 5 per cent solution and painted around the gums. Methylene blue may be used by painting the lips and face and tissues not involved with KY paste or vaseline and applying the dry powder directly to the gums on a pledge of cotton. In this way the staining of the other tissues is somewhat eliminated. Neutral aeriviolet in 1 per cent solution is also effective and gentian violet is useful in some cases. A 10 per cent solution of neosalvarsan and glycerin is used by some, but I have not been so successful with this treatment in routine work.

Among the caustics may be mentioned trichloracetic acid up to 100 per cent, phenol 5 per cent, and chromic acid up to 100 per cent. These are bactericidals, but all destroy tissue, and extreme care must be exercised in their use. It would appear that if caustics are to be used at all, they should be used in connection with some other form of treatment. Personally, I do not find it necessary to use drugs for their caustic action in treatment of this disease. If caustics are to be used for their caustic effect, they are not necessary in the acute stage but may be used in chronic conditions.

As an oxygen-liberating medium, sodium perborate may be used because of the quantity of oxygen released and also because of its alkaline reaction. A thick paste of sodium perborate and water is applied to the mucous membrane by some operators.

The paste is allowed to remain as long as chemical action continues, then the mouth is rinsed and the procedure repeated for at least twenty minutes.

Of the alkalies, sodium bicarbonate may be used and sodium ricinoleate has been suggested. Soap has been recommended as a valuable adjunct in the treating of this disease, and it may be used in various forms. It would appear that cleaning the teeth with a tooth paste containing a high percentage of soap, depending upon this rather than on the chemical action of any paste, is efficacious.

I have found the treatment that is very satisfactory in most cases is to use a 10 per cent solution of chromic acid as a medium through which to obtain nascent oxygen. The gums and gingivae should be dried with pledges of cotton or cotton rolls used between the cheeks and the gum and under the tongue. A cup containing the chromic acid and another cup containing the hydrogen peroxide are placed side by side. A pledge of cotton is saturated with chromic acid solution and applied over the gingival surface after protecting the cheek with cotton or cotton rolls. Immediately upon applying the chromic acid a

pledget of cotton saturated with peroxide is placed upon the area. There will be a reaction with a formation of a black liquid. Enough of the peroxide should be applied to neutralize the chromic acid, and then the gums should be irrigated freely. This may be repeated a number of times. Depending upon the severity of the case, the patient will be seen once or twice or even three times daily.

Box, in a treatise on necrotic gingivitis, recommends the following treatment for acute Vincent's infection:

"The solutions used in this combination treatment are:

"(a) Churchill's tincture of iodine.

"The formula is as follows:

Iodine	16.5 gm.
Potassium iodide	3.3 gm.
Alcohol (70%)	100 e.c.

"All the soft tissue surfaces are freely endowed with tiny crevices and microscopic interspaces in which are present, in necrotic gingivitis, large numbers of microorganisms. Into these minute openings the iodine solution must necessarily penetrate. Churchill's tincture of iodine, because of its low surface tension, rapidly flows to the gingival crevices of teeth adjacent to the point of application and readily seeps into all the microscopic irregularities.

"(b) Thirty-five per cent aqueous solution of silver nitrate.

"Steps in the topical application of the tincture of iodine-silver nitrate combination:

"(a) Place on the bracket-table two glass containers (inverted glass castor-cups serve the purpose very well), and governed by the area of soft tissue to be treated, place on one of them five to ten pellets of cotton, match-head in size, and saturated with Churchill's tincture of iodine. On the other, five to ten pellets of cotton, slightly larger than the head of a match, and saturated with 35 per cent aqueous solution of silver nitrate, are placed. The making of cotton pellets and dipping into medicine bottle by the operator after the treatment has begun are impediment procedures that tend to make the consecutive application of the medicaments more difficult.

"(b) Next isolate the affected area with cotton rolls, and with sterile cotton pellets gently dry the tissues, being careful not to induce bleeding. (It may be pointed out here that Adams does not advocate the drying of the tissues before the application of the medicaments.)

"(c) One of the cotton pellets saturated with Churchill's tincture of iodine is taken in the pliers and lightly touched to the amelobogingival border. With slight compression of the pellet, the liquid flows rapidly because of its low surface tension over the ulcerated tissues, along the gingival crests, into the gingival crevices, and between the teeth. Care must be taken that the tincture is not allowed to flow over the alveolar or other oral mucosa, as it occasionally has an escharotic action. The use of small pellets of cotton, saturated but without great excess of tincture, the gentle contacting with the tissues, preceded by their careful drying, tend to limit the flow of the solution to the parts affected.

"Where there has been great loss of tissue between the teeth, frequently with marked cupping-out of the structure, and close apposition of the roots, difficulty is occasionally experienced in the placing of the tincture at the base of

this interdental space. This is easily overcome by the use of the chip-blower. Having first removed the saliva and detritus and deposited the tincture, with a light current of air, the tincture is gently blown to the base of the space, to be followed at once with the solution of silver nitrate.

"(d) A pellet saturated with the 35 per cent solution of silver nitrate is immediately carried in the pliers to the regions holding the Churchill's tincture and gently compressed. The tiny crevices and fissures again act as sluiceways for the silver nitrate solution, which combines with the iodine tincture, resulting in the formation of a bright whitish-yellow precipitate in the necrotic and ulcerated tissue. The tooth is left stainless, then aqua ammonia is applied to it.

"The chemical reaction between the two solutions results in the precipitation of the insoluble iodide of silver which seems to form within the necrotic tissue. This whitish film turns dark in the light and in thirty-six hours, as a rule, is cast off. It seldom leaves behind a bleeding surface, all ulcerations except the large ones being covered as a rule with new epithelium. Furthermore, the rapid reduction of the attendant gingival inflammation is a particularly striking feature."

MOUTH WASH

Box recommends the following formula as more efficient and more pleasant than the plain perborate:

R	Sodium Perborate	120.00 gm.
	Sodium Oleate (neutral)	120.00 gm.
	Saccharin	0.05 gm.
	Oil Orange	0.30 e.e.
	Oil Wintergreen	1.20 e.e.
	Oil Peppermint	0.60 e.e.
	Oil Rose	0.20 e.e.

Sig.: A teaspoonful to a glass of warm water to be used as a mouth wash as directed. Mix fresh before using.

A number of operators suggested the following formula:

R	Fowler's Solution	4.00 e.e.
	Glycerin	30.00 e.e.
	Wine Ipecac	4.00 e.e.
	Hydrogen Peroxide, q. s. ad.	90.00 e.e.

Sig.: Use as mouth wash four times a day, diluted with a small amount of warm water.

I recommend the following mouth washes:

R	Saccharin	0.09 gm.
	Oil Wintergreen	1.20 e.e.
	Sodium Perborate	60.00 gm.

Sig.: Teaspoonful in glass of warm water as a mouth wash.

R	Oil Clove	0.18 e.e.
	Oil Wintergreen	0.10 e.e.
	Saccharin	0.03 gm.
	Sodium Bicarbonate	10.00 gm.
	Sodium Chloride	10.00 gm.
	Sodium Borate	10.00 gm.

Sig.: Teaspoonful in glass of warm water as a mouth wash.

R	Saccharin	0.06 gm.
	Oil Neroli	0.36 c.c.
	Tannic Acid	3.60 gm.
	Sodium Bicarbonate	20.00 gm.
	Sodium Chloride	20.00 gm.

Sig.: Teaspoonful in glass of warm water as a mouth wash.

R	Oil Neroli	0.06 c.c.
	Oil Clove	0.06 c.c.
	Oil Wintergreen	0.06 c.c.
	Saccharin	0.03 gm.
	Sodium Perborate	10.00 gm.
	Sodium Chloride	10.00 gm.
	Sodium Bicarbonate	10.00 gm.

Sig.: Teaspoonful in glass of warm water as a mouth wash.

or one of the following drugs may be used:

R	Potassium Permanganate	1:1,000
	Mercury Bichloride	1:1,000
	Metaphen	1:1,000

INSTRUCTION FOR THE HOME CARE OF THE MOUTH

At the first appointment the patient is instructed how to care for the mouth at home. He is asked to throw away all old toothbrushes and to get two new brushes. After using one brush, it is sterilized and allowed to dry, and the other brush is used the next time. The teeth should be brushed at least three times each day. I recommend one of the following tooth powders:

R	Sodium Carbonate anhy.	2.00 gm.
	Castile Soap powd.	25.00 gm.
	Oil Clove	0.10 c.c.
	Oil Wintergreen	2.00 c.c.
	Saccharin	0.06 gm.
	Sodium Perborate	25.00 gm.
	Calcium Carbonate ppt., q. s. ad.	100.00 gm.
R	Oil Clove	0.24 c.c.
	Oil Wintergreen	2.00 c.c.
	Castile Soap powd.	20.00 gm.
	Saccharin	0.12 gm.
	Sodium Perborate, q. s. ad.	100.00 gm.

The mouth wash should be used every three hours. In severe cases the mouth should be washed each hour, and the patient should be instructed to work the liquid in between the teeth and to try to self-cleanse the area as much as possible.

Before the patient is dismissed, he is given the following directions:

Avoid absolutely the use of tobacco, alcohol, spices, and all irritants. Take a mild saline cathartic.

Give careful attention to the diet. Eat little, if any, meat or sweets during the course of the disease. Take fresh fruit, fruit juices, and green vegetables in liberal quantities.

Rest as much as possible. Fresh air and sunshine are important.

Use separate dishes, glasses, and eating utensils and have them boiled after using.

The patient is warned against kissing or otherwise spreading the infection.

He is given a prescription for use in case of great pain. Extremely bad cases should be hospitalized.

REFERENCE

1. Gilmer, Thomas L.: *Dental Review* 19: 459, 1906.

LESIONS OF THE ORAL CAVITY AND OF THE JAWS AND THE REGION OF THE JAWS, INCLUDING THE TEMPORAL FOSSA, ORBITAL CAVITY, AND SINUSES

JOSEPH COLT BLOODGOOD, M.D., BALTIMORE, MD.

(Continued from page 503)

VINCENT'S ANGINA

SINCE 1927 Vincent's angina has become the most common lesion of the oral cavity. In that year I published my experience¹ with this spirillum infection of the mouth in the *Journal of the American Medical Association*. Then leucoplakia was the more common among the benign lesions of the mouth. This increase in Vincent's angina infections is due to the fact that overcrowding in this country and a much more rapid exchangeable movement of population have taken place since the war. In the trenches in France this lesion of the mouth was more frequently observed than in any previous war and has continued to be a prominent infectious, communicable and contagious disease in crowded centers since the war. In addition to this, the message of the medical profession in regard to preventive medicine and the importance of the earliest recognition of disease is reaching more and more receptive minds. When we tell every one to seek an examination the moment they observe a soreness in the mouth or a sore spot, every individual with Vincent's angina infection and with practically every other benign lesion of the mouth will come under observation of the dental or medical profession. When all the population reacts intelligently to this information, we shall practically never see cancer of the mouth anterior to the tonsil. The lesions will be leucoplakia due to tobacco and ragged, dirty teeth; fibroma and keloid due to trauma—a scar tissue tumor; warts, ulcers secondary to leucoplakia, or the direct result of the injury or irritation of teeth, or the syphilitic or tuberculous ulcer which are due to their specific infections and as a rule localize by injury or trauma from the teeth; hypertrophied papillae; areas of irritation which may be due to Vincent's angina or any other infection.

In 1921, after a complete study of all the records of lesions of the oral cavity in the Surgical Pathological Laboratory of the Johns Hopkins University, I find that I did not mention this lesion in the paper entitled "Cancer of the Tongue, a Preventable Disease."²

In a survey of the oral cavity today, the omission of a study of smears made from scrapings around the teeth and studied for the spirillum of Vincent's angina is just as great a mistake as the failure to take the Wassermann reaction, the blood sugar, or blood pressure.

Vincent's Angina as the Sole Cause of a Sore Mouth.—There is no question that this organism may be the sole cause of the sore mouth, whether it is a single or multiple spot or a diffuse stomatitis and glossitis, even with the involve-

ment of the fauces and pharynx. When it is the sole cause of the mouth lesion, it is almost immediately relieved by proper treatment, just as a syphilitic lesion is by intravenous arsphenamine, radiosensitive tumor by radiation, or malaria by quinine. The Vincent's angina infection may accompany every other benign or malignant lesion of the mouth, and as a rule these other lesions are distinct local growths which can be seen and felt.

I shall mention these frequently and describe them later in detail. The more common are leucoplakia, fibroma, wart, ulcer, glossitis, fissured tongue,



Fig. 1.—Pathol. No. 35576. Vincent's infection (angina). Note the red area on the gum around the mandibular canine. Treated in 1924, well in 1929.

hypertrophied papillae, hypertrophy of the labial glands of the mucous membrane, fissures and cracks, pyorrhea pockets about the teeth, areas of irritation and geographic tongue, lymph- and hemangioma, ranula, hypertrophy and inflammation of the sublingual glands, calculus in a gland, gum-boil, epulis of the alveolar border, and malignant disease. In these distinct lesions it is always a good plan to make the examination for Vincent's angina and to clean up this lesion or at least attempt to do it before instituting any operative measures. Especially is this so when the Vincent's angina infection is diffuse and intense.

Clinical Picture.—This infection, known in the literature as Vincent's angina, could easily be called erysipelas of the mouth, because a diffuse, distinct redness different from the redness of the normal mucous membrane is the characteristic naked-eye appearance. A single spot is the unit (Fig. 1). This spot

is a red area of irregular outline, never sharply defined. The center of the red area may be covered with a whitish or grayish patch which is due to a superficial necrosis of the mucous membrane. Around this superficial slough there is the red zone. It is not unlike a minute gumma in which the central zone of necrosis is surrounded by a red zone of collateral vascular anastomosis. The infection may be multiple or diffuse (Fig. 2); it may even involve the whole oral cavity, extend to the fauces and pharynx, and suggest diphtheria. The diphtheritic type in civil practice is rare and in my experience is never associated

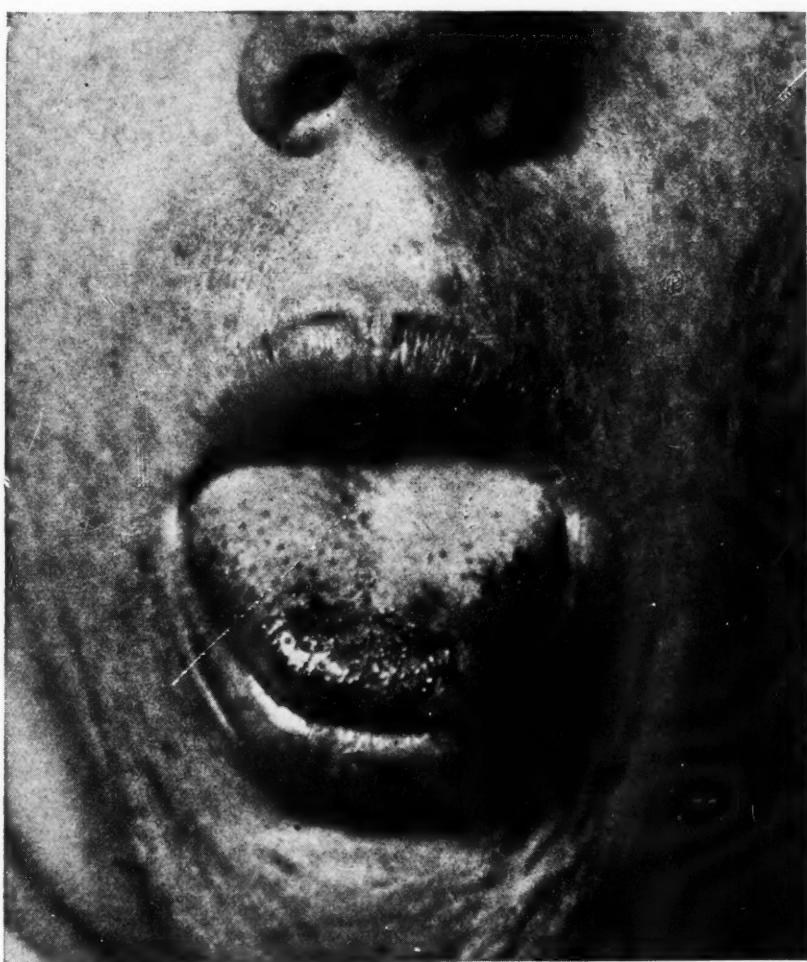


Fig. 2.—Pathol. No. 35334. Photograph of tongue showing extensive glossitis and definite lesions of Vincent's infection. The entire mouth and fauces in this case were involved. Rapid improvement under perborate of soda. This photograph was published in the Journal of the American Medical Association, April, 1927. Well in 1929.

with the signs of toxemia as in diphtheria. It reacts readily to treatment. The next stage of the single or multiple spot is a minute ulcer. These minute ulcers never look like the so-called canker sores, nor are they ever as tender. The canker sore is covered with a whitish exudate. I have no evidence that it is due to the Vincent's angina infection. In Vincent's angina I have never seen an ulcer larger than a ten-cent piece. The edges are never indurated like cancer,

nor ragged and undermined as in tuberculosis, nor punched-out like the syphilitic ulcer. Large ulcers of the size of a ten-cent piece are rare. Single or multiple minute ulcers are more frequent. The most common situation is on the gum between the teeth and in pockets about the teeth, as shown in Fig. 1. The next is on the edge of the tongue which comes in contact with the teeth as shown in Fig. 2. The next most common situation is where the gum comes in contact with the teeth. Areas other than these are seen only when the infection is diffuse and the number of organisms per cover slip is very large.

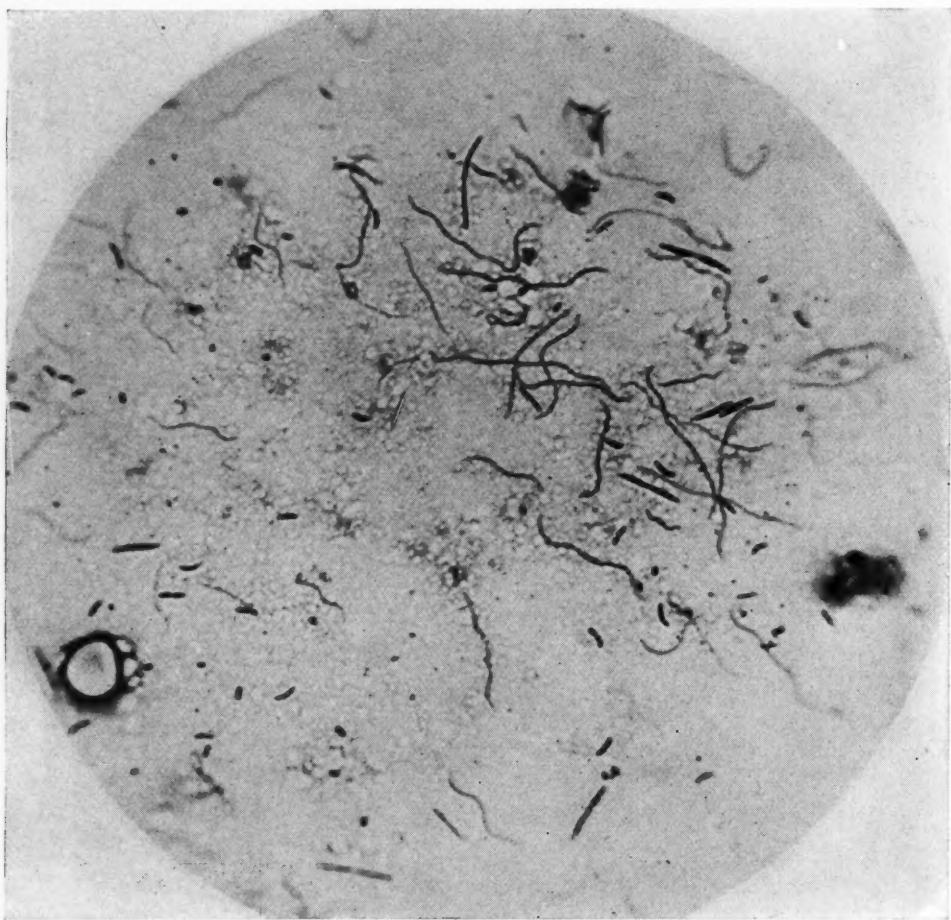


Fig. 3.—Pathol. No. 35334. Photomicrograph of stained smear from mouth showing the spirilla.

Vincent's Angina and Teeth.—Up to the present time we have never found this organism in the mouths in which there were no teeth and no remains of roots of teeth. This suggests that the spirillum lives about the teeth, in pockets between the teeth and the gum. Now and then we see it in either young or old people with clean, good teeth and with normal gums. But in such instances the infection has been virulent and usually epidemic. In the great majority of instances there are pockets in the gums, receding gums, rough, dirty teeth, bridge work. The more pockets there are about the teeth and spaces under bridge work, the greater is the opportunity for this infection.

Dr. Norval H. McDonald of Baltimore, a member of the Dental Corps of the Army, when he returned from France in 1919, gave me a clear description of the disease, instructed me and my associates in its microscopic appearances (Fig. 3) and informed us of the specific action of sodium perborate. As I have already stated here, in 1921 our cases were not sufficiently numerous to mention this lesion in the paper on "Cancer of the Tongue."

Origin of Infection.—I am confident that the chief predisposing cause is the condition of the teeth and the gums. The next is neglect of ordinary oral cleanliness. The third factor is the mixing with a larger number of people, especially in overcrowded dining cars, restaurants and hotels. Here there is a greater opportunity than in one's home to get the infection through actual contact with contaminated food and utensils used to serve food. In all regions of this country where large numbers of people congregate in hotels, my dental col-

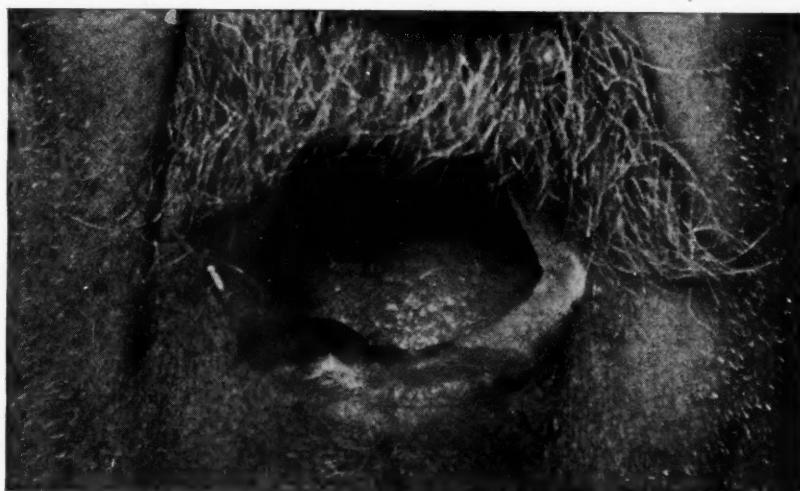


Fig. 4.—Pathol. No. 31203. The red area of the lower lip to the right is Vincent's angina infection. The white area on the left lower lip is leucoplakia. The tongue is covered with spots of leucoplakia. Not shown in the photograph is a cancer of the mucous membrane of the left cheek originating in a patch of leucoplakia. This man died of cancer five and one-half years after the first white patch was observed.

leagues tell me, Vincent's angina is rampant. In the practice of dentists whose patients chiefly live and eat at home, especially those who take good care of their teeth, this infection is rare. In the study of my own oral cavity during the past five years I find that my mouth has been contaminated after examinations of patients in the office and during traveling, especially in visits to overcrowded places. Fortunately, this infection is not dangerous. But if all such cases were reported, I am confident that it would lead to a far better technic in the handling of cooked and uncooked food and of the utensils in which food is served. I am beginning to look upon Vincent's angina infection as somewhat akin to ringworm. This infection which begins between the toes of the feet and extends to other parts of the body is most commonly acquired in gymnasiums, athletic clubs, public bathing places, where people walk around the floor on their bare feet and either pick up or leave the spore of this skin infection. To eliminate ringworm there must be a new and better technic in public

bathing places. To eliminate Vincent's angina there must be a far better technic in public eating places. Both conditions have increased with overcrowding.

Diagnosis.—In some instances it can be made clinically, just as the diagnosis of syphilis and tuberculosis. No one today should be content with a diagnosis of lues without a Wassermann reaction or of tuberculosis of the lung without looking for the tubercle bacilli in the sputum. The same is true with mouth infections. It is my rule now to make cover slips in practically every instance and search not only for the spirillum of Vincent's angina but for the streptococcus and pneumococcus, because since the pandemic of "flu" I am seeing more sore mouths, obscure stomatitis and glossitis in which organisms other than the spirillum are found in numbers larger than in the normal uninvolved oral cavity. It is important to record here that these other organisms of the streptococcus and pneumococcus groups come not from the gums around the teeth but from the tonsils, adenoids, nasal cavity or sinuses, and the mouth lesion is rarely cleared up until the tonsils or adenoids are removed, the sinuses drained, or the obstructing septum is corrected. Now and then we are seeing a diffuse irritation of the mouth after an attack of influenza in which there are no infected tonsils, adenoids, or lesions of the nose, nares or sinuses, but simply myriads of streptococci or pneumococci. These mouths need almost continuous treatment with some form of antiseptic, but, as a rule, when carefully studied, one will find a pocket of pus in a hypertrophied papilla, or a bit of a lingual tonsil, or a little cavity in the mucous membrane left after the removal of a tonsil. It is almost time to write a chapter on sore mouths due to infections other than Vincent's angina.

Oral Survey.—It may interest the readers of this article to know that this entire chapter on benign and malignant lesions of the mucous membrane of the mouth was written before I rewrote Vincent's angina, since 1921, when it appeared in the *Journal of the American Medical Association*. In these eight years our experience with lesions of the oral cavity, other than malignant, has tremendously increased, and, as I have stated before, Vincent's angina has become the most frequent of all the benign lesions. In the past few years we have examined an increasing number of mouths, because the patients were conscious of a stinging sensation in some spot, most frequently on the tongue, at the tip or edge, where the tongue comes in contact with teeth or plates; next in frequency at the papillae at the base of the tongue. But the painful or tender spot may occur anywhere. These cases may be divided into four groups. *Inspection is negative.* That is, we cannot pick out the spot that the patient is conscious of. Vincent's angina may or may not be present. *The spot is visible as a reddish area.* The spot is not typical of Vincent's angina, as it has not the central area of necrosis. The spirillum may or may not be present. *Third, the spot is typical of Vincent's angina* and the spirillum is always to be found in the cover-slip examination.

In the fourth group, *the painful or stinging area is a scar*, never of the type of fibroma to be discussed later and as a rule no keloid in it. The scar tissue is no more than would be expected to follow the treatment that the original spot had in the beginning. We are not always able to ascertain what the original

lesion was. The usual treatment is the application of some acid or caustic, or the actual cautery; in recent years, of radium, and, still more recently, diathermy or electric coagulation. In a limited number of cases a piece has been cut out with the electric cautery or the electric needle. In some of these cases a microscopic section has been made and in a small percentage of the cases a diagnosis of malignancy from this section. As a rule the section has been lost. When it is available, the study never reveals cancer but leucoplakia, hypertrophied papillae, or practically normal epidermis or mucous membrane. None of the patients in these four groups have later developed cancer.

The point is that in all these four groups the sensation of pain, tenderness, burning sensation, have been more prominent than the size of the lesion would justify, and the most exaggerated symptom in these four groups is the fear of cancer. We see these cases in women more frequently than in men. Tobacco is not always a factor. The teeth may be clean and smooth, but areas of this kind with stinging sensation may be present in the users of tobacco and those with ragged, dirty teeth and pyorrhea. The most important factor in treatment is psychic. The patients must be relieved of their fear of cancer. This is helped by a most rigid and thorough examination of mouth, fauces, pharynx, nares, sinuses. These patients are helped in clearing up the Vincent's angina, if present, with perborate of soda; persuading them to discontinue tobacco, if it is a factor; cleaning and smoothing the teeth if indicated; extracting roots or teeth if there are root abscesses; treating pyorrhea pockets, if present—a purely dental problem; looking for any infected papillae at the base of the tongue and the usual treatment of tonsils, adenoids and the nasal cavity.

This oral survey, which includes the nasopharynx, nose and sinuses and x-rays of the teeth, is being forced upon the surgeon who has interested himself in cancer of the mouth. There is no difficulty whatever in recognizing leucoplakia which is relieved by the discontinuance of tobacco and the cleaning of the teeth. Fibroma, wart, and ulcer are perfectly definite local lesions. The wart and ulcer should always be excised with a margin sufficient for cancer, as will be discussed later, and the area of uninvolved tissue removed, checked by frozen sections. Fibroma, in areas subjected to trauma, should be removed, also with a margin sufficient for cancer. Hypertrophied papillae should be left alone unless there is something else, like wart or ulcer, which indicates an excision to exclude cancer. In the beginning, the largest number of patients in the painful scar group were those whose first lesion was apparently hypertrophied papillae for which there had been treatment without removal of the cause, leaving the patients often with the cause and a painful scar.

I find that dentists are often baffled by these patients complaining of painful spots in the mouth in which the local lesion is either invisible or very slight. The dentists are beginning to recognize the Vincent's angina spot and are learning to use the cover slip and the microscope in the diagnosis. They may differ as to treatment, but they have overcome the most important obstacle—diagnosis. The dentist is not so closely in touch as yet with the medical diagnostic clinic (so that he can be helped quickly by a thorough examination of nose and throat) and the various laboratory tests, as well as a general survey, because

these patients with such painful spots and scar pains and areas of irritation with and without Vincent's angina may have other factors which keep up the local condition—syphilis, tuberculosis, scurvy, pellagra, some vitamin deficiency, some deficiency of internal secretion, some type of indigestion with and without achylia, constipation and colitis, diabetes. The point is, as the number of patients with this type of lesion increases, the percentage of those in which the cause will be found outside of the oral cavity increases also more and more, and, because of the fear of cancer, there is a psychic factor not only to be considered, but to be relieved.

For the oral survey there must be a good light. I prefer the cold Cameron light, which is quickly disinfected by dipping it in alcohol and then burning the alcohol. One should look into every crevice and every pocket about the teeth, in the floor of the mouth, the cheek, the hard and soft palate. One must become familiar with the changing appearance of the papillary area of the tongue and of the area of mucous membrane over the sublingual glands. After inspection, there must be palpation with the fingers of one hand in the mouth and the other hand beneath the neck. This allows one to palpate especially the floor of the mouth. Many otherwise well trained members of the dental and medical professions are not so familiar as they should be with the appearance of the different areas of the mouth, fauces and pharynx, and the normal palpation. As a rule, if in an area not subject to irritation by teeth and plates you can feel with the finger a spot and it is not leucoplakia or fibroma, it is better to excise this palpable spot as if it were the beginning of malignancy and study it immediately in the frozen section.

Another exception may be a small angioma which can be felt but need not be removed.

Do not be content with only inspection of the tonsils—apply the glass suction apparatus. As a rule my associate Dr. Pound and I get more from transillumination of the sinuses than from x-ray plates. Never neglect films of the teeth.

Treatment.—In the experience of my associate, Dr. Long, in the dental department, and myself, if we find Vincent's angina spirillum present in the smears and do not get quick results from cleaning the teeth and the use of perborate of soda, we immediately search for some other cause. I am beginning to feel that reinfection is more common in Vincent's angina than we realize, and it may be necessary for the patient constantly to use perborate of soda two or three times a week and have his teeth cleaned by a dentist more frequently.

The majority of dentists agree as to the mechanical cleaning of the teeth, but they do not at all agree as to the antiseptic to be used afterward, and many other drugs are employed as substitutes for perborate of soda or in conjunction with it. I shall not go into this controversy but give a brief description of what we do in our dental department, or what we advise the patient's dentist to do, and what we tell the patient to do in the toilet of his own mouth, repeating and emphasizing the four factors that seem to explain the failure to cure immediately or permanently what is diagnosed as Vincent's angina infection.

The first is the failure to recognize and remove other factor or factors besides the spirillum which are the cause of the irritation or infection of the oral cavity. Second, the failure on the part of the patient to clean his mouth immediately after eating, no matter how many times a day he eats. If any food is allowed to accumulate in mouths with this infection, even a few hours, treatment will fail. Third, reinfection. This is especially true in people who dine in public places and travel much. Fourth, the failure on the part of the patient to discontinue tobacco and visit his dentist as frequently as directed.

Our treatment of cleaning the mouth is identical with the method we use for preoperative cleansing of the teeth and gums. The teeth are cleaned by the dentist in the usual way. The tartar is all removed, the cavities are filled, roots are extracted, abscessed teeth are extracted. After cleansing the teeth, the gums and the pockets are covered with a paste of perborate of soda; the teeth are literally buried in this snow paste. This is then rinsed away with warm water. Then the gums are painted with mercurochrome, and the patient dilutes what is left in the mouth with saliva and keeps rinsing the mouth with this for five minutes, then washes the mouth with warm water. If there is a definite pocket around the tooth, there is no objection to the dentist applying a stronger antiseptic, but repeated applications of strong antiseptics or caustics are irritating.

The patient must now keep his teeth clean. After every meal they should be brushed, and if food is caught in such a way that the brush does not remove it, it should be extracted with the toothpick or dental floss. Then the mouth should be rinsed with some mild alkaline antiseptic solution. The best and most economical is liquor antisepticus alkalinus. At least once a day, and best at night, the patient should put a teaspoonful of the perborate of soda in his mouth, make a paste with his saliva and keep it in his mouth for at least five minutes. It is a good plan to use a toothbrush with this paste. The patient in some instances can be taught to use mercurochrome. Now and then the new antiseptic hexyl-resorcinol (ST-37) is valuable. When the smears show organisms other than the spirillum or when there is any granulating wound in the mouth, the use of 1 per cent chlorazene as a mouth wash will be found very valuable.

I have now experimented with this treatment in many cases for more than five years. I have used it myself. Again and again I have demonstrated Vincent's angina infection when traveling and found that the daily use of perborate of soda is preventive. Both dentists and patients must realize that the fundamental principles of disinfecting the mouth are the same as those of infected wounds and are best illustrated in the Carrel-Dakin method—repeated cleansing with mild antiseptics. One bath a week and one brushing of the teeth a day are no longer sufficient. Just as influenza and colds are attacking more and more individuals, so today, through the food and the hands, more bacteria are getting into the oral cavity. Dentists can save the teeth, fill the cavities, replace the teeth with bridge work and removable plates, but they cannot keep the teeth clean and the gums in proper condition when the gums are receding and there are pockets of pyorrhea. The repeated daily cleansing of the teeth and mouth

rests with the individual. In some cases it is impossible, and then, to clean up the infection, it is better to extract all the teeth.

APPENDIX

This is the second of a series of articles which are to appear in this Journal. They were first written by me for my colleague Dr. Dean Lewis, professor of Surgery of Johns Hopkins and editor of the *System of Surgery* published by W. F. Prior Company of Hagerstown, Md. Their republication in serial form in this Journal is through a personal arrangement between W. F. Prior Company and The C. V. Mosby Company. Nevertheless, I wish to express my thanks and appreciation to W. F. Prior Company for releasing this series, because it would be impossible for me to take the time to rewrite it, and I wish to congratulate The C. V. Mosby Company on its original idea for a series of articles of this kind for the aid of dentists interested in oral surgery and in the diagnosis of all the benign and malignant lesions of the mouth about which every dentist should know. As more and more people are taught to understand preventive medicine and to select their physician and dentist while they are well and to call upon them while they are well for a diagnostic survey, the majority of lesions of the oral cavity will be seen by a dentist first. Therefore, the dental profession needs special instruction, and articles of this kind should be made readily accessible in current literature.

The chapter on the Oral Cavity written for the *System of Surgery* will be found in Volume IV, Chapter 4. Each article is a complete survey of the entire material on that subject which has come under my own personal observation since 1892 and is preserved in the Surgical Pathological Laboratory of the Johns Hopkins University and Hospital.

As the article was written almost four years ago, I shall add a note at the end of each subject bringing it up to date. In spite of a large number of cases of Vincent's angina observed in the past four years, I find nothing new to add to this chapter. Many of my colleagues, both in personal conversation and in their writings use treatment other than with perborate of soda, especially intravenous arsphenamin, but my studies seem to suggest that when the treatment outlined four years ago fails, there must be another factor or some inaccessible cavity in the region of the teeth which has been overlooked, or the patient is in an environment in which reinfection is possible.

The most evident fact in regard to Vincent's angina observed by us in the past two years is that the number of cases referred to the clinic for diagnosis is on a steady decline. Vincent's angina of the oral cavity is less frequently referred to us with the provision diagnosis of tuberculosis, syphilis, or possible cancer. More and more the mouth cases referred to us for other conditions have been carefully investigated for this possible infection. More and more dentists make their own cover-slip examination and successfully treat this now common mouth infection. It is my opinion that more dentists should instruct their patients on the possibility of this mouth infection. It is probably the most common cause of a sore spot in the mouth in any individual who still has some of his own teeth. My investigations indicate that it is best not to put perborate of soda in a tooth paste, but to advise patients to have in the home and in the travel-

ling case a small bottle of perborate of soda. Whenever they notice soreness of the mouth they should put a teaspoonful of the powder in the mouth, mix it with the saliva, and when a paste forms, brush the teeth with this paste, then rinse the mouth with water. They should do this once a day. If the soreness does not disappear in a few days, they should see their dentist. I always carry perborate of soda when I travel, and the more I travel, the more I find I must use this specific treatment for this wide-spread infection. Perborate of soda is almost as specific a therapeutic test for Vincent's angina as arsphenamin is for syphilis, or irradiation with x-rays or radium for a raysensitive disease.

In conclusion, I shall ask readers of this article to send me the x-ray films and other x-ray pictures and complete data in early lesions of the oral cavity which are difficult to diagnose. The more one increases the number of cases of this kind gathered from single individuals in this way, the better one is able to put in the literature statements which will really be helpful in diagnosis and treatment. For example, I want more cases of localized pain in the region of the teeth in which the first x-ray films were negative. That is, in which there were no signs of root abscess or any evidence of bone formation or bone destruction, yet further observation revealed the development of a malignant tumor or some other disease which produces bone formation or bone destruction. Such cases are uncommon. I am anxious to have more examples of carcinoma of the mandible in which the first symptom was a loose tooth, and the first x-ray film was interpreted as root abscess, and the first treatment was extraction of the tooth without any thought of the possibility of malignant disease, and no tissue was removed for microscopic study; yet, later, out of the sinus there appeared exuberant granulation tissue found to be carcinoma on microscopic study. This may be rare, but very few of these cases are reported in the literature. I am also very eager for more examples of swelling about the alveolar border of the teeth resembling the ordinary gum-boil, epulis, or ordinary hypertrophy of the gum which later turned out to be a malignant tumor and not a benign condition. I am particularly eager to increase the number of x-ray films showing areas of bone destruction in the maxilla or mandible, perhaps no larger than a ten-cent piece, in which the microscopic study has revealed malignant disease, adamantine carcinoma or sarcoma and not the ordinary dental root abscess or cyst, or the dentigerous cyst or the fibroma. Because, if malignant disease is recognized when the x-ray picture discloses this small area, a cure should be accomplished without mutilation. In fact, both, the medical and the dental professions should never take for granted that localized pain with a negative x-ray picture in the region of the teeth and jaws, or a loose tooth or teeth with an x-ray not typical of a root abscess, or a simple swelling along the gum, or a simple swelling of the maxilla or mandible in which the x-ray picture shows a small area of bone destruction, excludes the possibility of malignant disease. It is such cases that should be examined most thoroughly, and at the operation tissue should be removed for either immediate frozen section or a microscopic report within a week. These little areas of disease can all be cauterized in the dentist's office under local anesthesia, tissue removed for diagnosis, and, when properly managed, there is little added danger in delay of a few days for the microscopic report. The greatest danger is in treatment without tissue removed for diagnosis, because if the disease is ma-

lignant, any interference without complete eradication and a longer interval of time decreases the chances of a cure even with mutilation. Dentists must also learn when a suspicious lesion of the oral cavity should receive treatment with x-rays or radium even before biopsy.

Now that people are becoming enlightened and are seeking the advice of the medical and dental professions we shall see more of these very early conditions. The oral cavity becomes a fascinating problem in the development of the complete diagnostic survey. When I began my studies of lesions of the oral cavity and of the jaws forty years ago, there was very little diagnostic dilemma—it was a question of a huge mutilating operation demanding the most expert anesthesia and surgical experience and skill. The results in permanent cures of malignant disease were scanty, and the number of those temporarily relieved by the operation was only a little larger. The object of this series of papers is to bring before the dental profession what we know and to stimulate the profession to aid in increasing the number of available cases in the earliest stage of the disease for the same type of studies by which these articles were made possible.

REFERENCES

1. Bloodgood, J. C.: J. A. M. A. **88**: 1142, 1927.
2. Idem: J. A. M. A. **77**: 1381, 1921.

(To be continued)

A REVIEW OF THE ORAL SURGERY LITERATURE FOR 1931

GORDON R. MAITLAND, D.D.S., DETROIT, MICH.

THE dental and medical journals of 1931 had an abundance of interesting material on oral surgery. To cover the entire field here would be impossible, but I shall endeavor to review some of the articles, trusting they will be of interest.

"Fractures of the Upper Jaw and Malar Bone" by Ivy and Curtis¹ is an unusual article with clear drawings and illustrations. It is my opinion that these two men are outstanding figures in this particular field. In their classification they describe (a) fractures of the alveolar process, (b) unilateral, (c) bilateral horizontal, (d) bilateral fractures of the maxilla, with treatment for each type.

In discussing fractures of the malar bone and zygomatic arch, they bring to our attention the symptoms, such as depression of malar fragment may cause diplopia, numbness of the skin over the distribution of the intraorbital nerve, tenderness at points of fracture and irregularities when palpated.

They believe the usual positions for obtaining roentgenographic films to show fracture lines and depressions of the bone in this region frequently give unsatisfactory results. The technic suggested by Stone in the paper quoted is, in his opinion, superior to any previously used. A superoinferior view of the skull is made by having the patient rest the chin on the edge of the table, the tube being beneath the table and the plate on top of the head. The treatment which they have found to be most successful consists of a very small horizontal incision made three-quarter inches vertically below the outer canthus of the eye through the skin, and carried down to the bone. A special corkscrew-like instrument is passed through the middle of the depressed bone, and by this means a firm hold is obtained whereby the fragment can be manipulated into place.

Blair, Brown and Moore² tell us "Osteomyelitis of the jaws is frequently associated with the extraction of or other dental trauma to teeth during the acute stage of infection. It may also occur spontaneously, (1) most frequently around an area of neglected dental caries or apical abscess formation, (2) less frequently associated with upper respiratory diseases, and (3) in association with osteomyelitis elsewhere in the body.

"It occurs far oftener in the lower than in the upper jaw (perhaps 8 to 1) in those cases associated with extraction, due to poor drainage afforded a mandibular tooth socket and the excellent drainage from a maxillary.

"Prevention or early care of dental caries, and avoidance of dental trauma or extraction during the acute phase of an infection, will do much toward eliminating osteomyelitis of the jaw.

"The treatment of osteomyelitis should be conservative as far as operative attacks on the bone itself are concerned."

Gardner³ and his staff give a paper well worth reading on preoperative and postoperative conditions associated with the extraction of teeth. Both the

younger and the older men can review the much discussed procedure of hot and cold applications. It also tells about actinotherapy and its uses. You can contradict some of the statements of the lamp salesman after reading this article.

Mead⁴ tells us "The outstanding factor in surgery of the mouth is correct diagnosis." He advocates preoperative and postoperative roentgenograms of all patients.

There is a well presented paper by Adson⁵ starting with historical sketch, etiology, symptoms, differential diagnosis and treatment, concluding with technic for both alcoholic injection and major operation for trigeminal neuralgia. He tells of the progress made in treating this terrible affliction since 1773.

The following editorial by the Editor of the *Pacific Dental Gazette* describes the value of the "Symposium on Bone" presented by Drs. Howe, Meyers, Lyons, Beck and Lischer at the annual meeting of the Alumni Association of the College of Dentistry, University of California, San Francisco, January 5 and 6, 1931. "The above symposium on bone pathology is of exceptional importance for reasons such as the recognized standing of the various contributors as authorities on the subject; the importance of the many aspects of bone pathology to the oral surgeon and the dental clinician; the state of confusion concerning bone destruction and bone repair, in fact the entire field of bone pathology, and lastly, the fact that the series of papers contains the latest observations of investigators and clinicians in one of the most important divisions of pathology, general and dental."

Dr. Lyons⁶ summary on "Bone Changes From a Surgical Standpoint," follows. "Summarizing the changes which take place in bone and in resorption and osteogenesis, I will reiterate that there are many of the physiologic changes which with our present knowledge must still remain obscure until further investigation is made. We know that bone can and does regenerate. We do not know definitely the part, if any, that the periosteum plays in the osteogenetic process. We do not know definitely the origin of the osteoclast or whether other factors in bone resorption do not play as great a rôle. We do not know what controls and limits the formation of the callus in fractured bones. We know that sepsis, certain constitutional diseases, deficient blood supply, debility, and old age are conditions which tend to delay or prevent bone regeneration, and conversely, youth and good health, asepsis and mild stimulating conditions favor osteogenesis. We know that bone is a complex and unstable tissue, subject to many changes and variations under the slightest abnormal conditions, and that the physical resistance of the individual is a prominent underlying factor in its behavior. If we keep in mind that there are certain definite requirements which nature exacts in bone repair, we would be better able to understand the significance of bone lesions and should be better able to treat them intelligently."

Blair and Brown⁷ write one of the most interesting articles of the year on harelip technic. The authors bring out the fact that the best results are obtained not by new but by the accepted standard methods. There are more than sixty illustrations in the article well described. In the following issue of the same periodical, the authors discuss "Harelip Repairs," which is equally well written and illustrated.

Cogswell⁸ describes some of the histologic conditions present in bone. He

tells of the direction in which the bone fibers are found and states, "My observation of these variations found in the normal structure of the oral cavity and the mechanical peculiarities of bone composition are of great importance in successful surgical interference for the removal of teeth." I believe there is a scarcity of literature on this important subject.

Schreiber⁹ presents five cases in which neurologic manifestations followed directly upon extensive extraction of teeth. He believes this can be eliminated to some extent when we find underlying pathology present. This is the only article found in the literature on this subject.¹⁰

Winter¹¹ has presented a paper with clear illustrations on the surgical preparation of the mouth. He has made an attempt, and I believe he has succeeded, to show the general practitioner with the average surgical skill, the treatment necessary in mouths where obstacles present themselves in prosthodontia.

Thomas¹² has given, in a very clear and concise manner, a paper of great value to those who wish to review a series of conditions that the oral surgeon encounters routinely. He includes cysts, fractures, impacted teeth, removal of teeth in general, acutely abscessed teeth, acute osteomyelitis, necrosis, local anesthesia, nitrous oxide-oxygen anesthesia, Vincent's infection, sutures, dry sockets, removal of frenum, neuralgia, paralysis of lower lip and tongue, maxillary sinus conditions, roentgenographic interpretations, and mouth diagnosis from a health standpoint. This paper is well worth a place in your dental library.

In describing technic for the removal of broken needles, there is no definite procedure to follow, but Moose¹³ tells us, "The primary facilitating factor in operating in such cases is liberal incision, allowing ample access and retraction of both lips of the wound, with a minimum of tension." He believes a 42 mm. needle is the right size for injection, because a sufficient portion of the needle will protrude from the tissue if the injection is approximately correct.

The advantages and disadvantages of anesthetics are discussed by Rounds¹⁴ who states, "With procain and gas and oxygen we have at our disposal anesthetic agents capable of taking care of the anesthetic needs of the dental profession today." He includes in this article ethyl chloride, ethylene and ether, but not extensively.

We all agree with Goodsell¹⁵ when he says, "The possibility of a scar is the chief deterrent factor in an extraoral approach to mouth and jaw surgery, but we should not hesitate to incise the outside of the face where the best interests of the patient undoubtedly demand such procedure. As a rule such openings can be placed so as to conform to the lines of the face, and if objectionable scars do appear, they can usually be removed without great difficulty."

Mavrocordato¹⁶ believes that, "The ultimate biologic results of the apicoectomy will be prolific bony regeneration filling up the crypt in a few months' time. C. Coolidge demonstrated experimentally secondary deposition of cementum, covering the exposed dentin of the stump, together with encapsulation of the exposed part of the root canal filling by tense fibrous connective tissue. These changes can guarantee beyond doubt the eradication of the infection and the value of the operation."

An interesting, illustrated and scientific paper with material gathered from 180 patients by Stafne¹⁷ states, "Most of the complications for which supernumerary teeth are responsible can be avoided by early recognition of the presence of the supernumerary teeth and proper interference. Removal of these teeth at an early age may be a means of avoiding the majority of cases of delayed eruption and noneruption, extrusion, separation and malposition of permanent teeth."

Dunning¹⁸ believes that complications arise in the antrum due to lack of proper care. His advice in removing roots from the antrum, immediately, is very sound and will avoid a great deal of future trouble for both patient and operator. He briefly describes his method for plastic closure of the antrum. He does not claim it to be original but I have always heard it called the Dunning flap operation. The three essential principles in closing an antrum he states, "are plenty of tissue, no tension and good blood supply."

One of the recent theories causing impacted teeth is due to endocrine disturbances. Hardgrove¹⁹ states, "The impacted tooth and irregular teeth are, to a large extent, an endocrine problem and not one of resistance of an anatomic nature." He continues by saying, "Impactions do not occur in the deciduous teeth for the reason that, at that age, the endocrine forces are at their greatest activity if the child is normal and is fed normally." He thinks it is a mistake to allow the roots to develop when the tooth is sure to be impacted.

I²⁰ have found that the growth of the jaw is controlled by the amount of growth hormone formed by the pituitary gland at a given time. Growth hormone is effective regardless of the age of the patient. In a person who has passed the normal time for the cessation of the growth of a particular bone, it does not increase in length but in breadth. The jaw, however, is able to increase in all directions under the influence of the growth hormone. For example, in acromegaly, which is a condition due to a tumor of the pituitary gland with an excessive production of growth hormone, the jaw is markedly overdeveloped. In this condition the teeth become widely separated.

It is entirely possible that alteration in the shape of the jaw bone is frequently due to a disturbance in the amount of growth hormone. It is also said that mechanical factors are capable of altering the development of the jaws, even in the presence of a normal amount of growth hormone.

Lyons²¹ states, "Oral disease in numerous instances can be looked upon as being nothing more than a symptom of a generalized disease."

Blum²² describes thoroughly "Tumors of the Jaws." This article, if kept on file, should be of great assistance for future reference.

The 1931 literature presented nothing in the way of advanced technic on conduction anesthesia. Therefore no mention of the subject is made in this review.

REFERENCES

1. Ivy, Robert H., and Curtis, Lawrence: Fractures of the Upper Jaw and Malar Bone, *Ann. Surg.* **94**: 337, 1931.
2. Blair, V. P., Brown, J. B., and Moore, Sherwood: Osteomyelitis of the Jaws, *INTERNAT. J. ORTH. ORAL SURG. & RADIOL.* **17**: 168, 1931.
3. Gardner, Boyd, Stafne, E. C., and Wyckoff, B. S.: Further Consideration of Preoperative and Postoperative Conditions Associated With Extraction of Teeth, *J. A. D. A.* **18**: 1601, 1931.

4. Mead, Sterling V.: Exodontia for the General Practitioner, *J. A. D. A.* **18**: 1644, 1931.
5. Adson, Alfred W.: Diagnosis and Surgical Treatment of Trigeminal Neuralgia, *J. A. D. A.* **18**: 1695, 1931.
6. Lyons, Chalmers J.: Bone Changes From a Surgical Standpoint, *Pacific D. Gaz.* **39**: 254, 1931.
7. Blair, V. P., and Brown, J. B.: Mirault Operation for Single Harelip, *INTERNAT. J. ORTH. ORAL SURG. & RADIOL.* **17**: 370, 1931.
8. Cogswell, Wilton W.: Factors in the Surgical Removal of Teeth, *J. A. D. A.* **18**: 1751, 1931.
9. Schreiber, Frederic W.: Brain Injuries Following Multiple Extraction of Teeth, *INTERNAT. J. ORTH. ORAL SURG. & RADIOL.* **17**: 183, 1931.
10. Personal communication.
11. Winters, Leo: Surgical Preparation of the Mouth for Denture Prosthesis, *INTERNAT. J. ORTH. ORAL SURG. & RADIOL.* **17**: 581, 1931.
12. Thomas, Earl H.: Fundamentals Underlying the Practical Management of Various Oral Surgery Conditions, Roentgenographic Interpretations and Mouth Diagnosis From a Health Standpoint, *J. A. D. A.* October, 1931.
13. Moose, Sanford M.: Broken Needles, *J. A. D. A.* **18**: 1073, 1931.
14. Rounds, Frank W.: Basic Principles Controlling the Selection and Adaptability of Anesthetic Agents in Oral Operations, *J. A. D. A.* May, 1931.
15. Goodsell, J. Orton: Extraoral Removal of Unerupted Teeth, *Dental Cosmos* February, 1931.
16. Mavroeordato, Themis J.: Surgical Conservative Treatment of Pulpless Teeth With Chronic Apico-alveolar Lesions, *Dental Cosmos* **73**: 17, 1931.
17. Stafne, Edw. C.: Supernumerary Central Incisors, *Dental Cosmos* **73**: 976, 1931.
18. Dunning, Henry Sage: Surgical Treatment of Chronic Maxillary Sinusitis of Oral Origin, *J. A. D. A.* **18**: 1307, 1931.
19. Hardgrove, T. A.: The Impacted Tooth, *J. A. D. A.* **18**: 1287, 1931.
20. Personal communication.
21. Lyons, D. C.: The Inter Relationship of Oral and General Health From a Medico-dental Standpoint, *Dental Cosmos* September, 1931.
22. Blum, Theodor: Tumors of the Jaws, *Dental Cosmos* **73**: 745, 1931.

ABSTRACTS OF CURRENT LITERATURE

NUTRITION AND PEDIATRICS

BY SAMUEL ADAMS COHEN, M.D., NEW YORK CITY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Pathogenesis and Treatment of Acute Osteomyelitis of the Jaws in Nurslings and in Infants. Abraham O. Wilensky. *Am. J. Dis. Child.* **43:** 2, 1932.

In a highly instructive article Wilensky discusses the pathogenesis and treatment of acute osteomyelitis of the jaws in nurslings and in infants. Acute osteomyelitis of the maxilla and the mandible commonly occurs during the first few months of life and is characterized by (1) pathologic manifestations, which are referable to the mouth, nose, nasal pharynx and orbit; (2) sequestration and loss of the entire jaw and of the teeth which it customarily carries, with the subsequent deformity of the face; and (3) severe constitutional reaction associated with high mortality.

In reviewing the literature on the subject Wilensky finds that, similarly to its occurrence in long bones, there is a general agreement that osteomyelitis of the jaws is attributed to bacterial infection. In the author's experience the *staphylococcus aureus* is the commonest organism found in osteomyelitis.

An acute bacterial lesion on the surface of the body forms the portal of entry for the infection. One of the sources of the infecting organism invading the body is found in fingers or apparatus which are used in cleaning the baby's mouth after birth.

The fundamental cause of the spreading of the original lesion in the form of metastatic lesion is an infected thrombus lying in the original area of infection and communicating at some point with the freely circulating blood. Bone tissue, because of its peculiarities in vascular structure, seems particularly prone to the blocking of these thrombi-emboli. The secondary effects of these thrombi are disturbances of essential nutrition which lead to the death of certain bone cells and the consequent necrosis of certain areas of bone tissue.

In regard to osteomyelitis of the superior and also inferior maxillae, Wilensky writes that the dominating factor centers in the fact that the entire blood supply for either bone is derived from one large arterial trunk—the internal maxillary artery. The dominating position of the thrombophlebitis in the course of the vascular channels determines the superficial sight of the local manifestations.

The general clinical course of the disease is usually a clear-cut picture. Wilensky states that this disease, which usually occurs in healthy infants from two to ten weeks, may manifest itself with symptoms which vary from a mild

to severe gastrointestinal disturbance, from moderate to marked elevation of temperature, and from slight restlessness to severe and prolonged convulsions.

These constitutional symptoms are soon followed by such local manifestations as swelling in the infraorbital region accompanied by edema of the lower eyelids. In a majority of instances there is a localization below the inner canthus of the eye, and in addition, on inspection of the mouth, a swelling of the alveolar process and of the hard palate can be readily noticed.

The entire acute process with secondary changes lasts a few days, and if recovery occurs, the outcome is either (1) healing, with or without the persistence of discharging sinuses, or (2) the development of secondary purulent foci. Usually as a final stage, a single large abscess cavity is present and is in relation on all its sides to the palatal, alveolar, nasal, orbital and retromaxillary aspects of the jaw. In addition to pus, this cavity harbors the entire or major portion of the necrotic maxilla. In enumerating the symptoms, Wilensky emphasizes the fact that the discharge of teeth and of tooth buds through the fistulous openings in the alveolar process is the most characteristic phenomenon of this disease. It leaves the child without teeth over the affected area.

In the discussion of treatment and prognosis the author divides these cases into two groups. The first group usually terminates fatally in the early stages of the disease. Regarding the second group, Wilensky's experience leads him to state that as soon as definite areas of fluctuation are discovered these should be adequately but conservatively incised. Moreover as much as possible of the incising should be done through the interior of the mouth and nasal cavities.

By comparison, treatment of abscesses in association with the mandible seems to be more simple, and the author feels that one should follow the customary surgical principles. Sequestrums should not be removed until involuerum formation is abundant.

Vitamins in Relation to Health Problems: Short Review of Recent Work. S. J. Colwell. *Bull. Hyg.* 7: 3, 1932.

Colwell mentions some of the recent advances in our knowledge of the chemical nature of vitamins. In regard to vitamin A, there is now a general agreement that a pure substance carotene behaves in the body like vitamin A, and its activity in natural foodstuffs can hereafter be compared with a standard chemical substance. According to Scheunert and Wagner the common methods of household cooking could be applied to butter fat without producing any loss of vitamin A contained in it. To a lesser extent this is also true of vitamin A content of green or yellow vegetables.

Because experimental results thus far are contradictory, it cannot as yet be definitely decided whether animals can have their resistance to infection raised by giving them large doses of vitamin A.

The author mentions the experiments of May Mellanby, who found that pyorrhea alveolaris in the dog was associated with defective formation of the epithelium of the gums. It is interesting to note that puppies which have been given a diet deficient in vitamin A during early life are particularly liable to develop this disease, even though their diet later on in life was not deficient

in vitamin A. On the other hand, in the same experimentation it was observed that animals which received plenty of vitamin A during the first months of life did not develop pyorrhea in later life.

These and other experimental factors justify the truth of the general principle that correct feeding during the early childhood offers a chance of insuring perfect development of the tissues which cannot be repeated later.

The outstanding advance of vitamin D during the past year has been the isolation of what is believed to be pure vitamin in crystalline form. Credit for this achievement may be shared by Askew, Bruce, Callow, Philpot, Webster, in addition to Windaus, Luttringhaus and Auhagen.

Vitamin D brings up the matter of rickets. There is a general agreement that infants and children brought up in temperate climates require a greater supply of vitamin D than is usually present in their ordinary food, to insure their freedom from rickets. The author quotes Kolster, who, from a study of children in the northern parts of Norway, found that rickets occurred in children up to seventeen years of age. This investigator also noted that the incidence of rickets was related to the diet in that part of the world, and that it was dependent upon intake of fresh fish, which contains the liver oil. On the other hand from his study of the incidence of rickets in India, Wilson noted that an inadequate diet, both quantitatively and qualitatively, generally produced rickets or osteomalacia, although sunlight is abundant there.

Mellanby and others have found that vitamin D has a definite retarding action on the progress of dental caries in children.

Vitamin B may be better termed vitamin B complex by virtue of the fact that there are at least four if not some six or seven separate factors. The more important of the complexes (if we may judge their relation to food and health) are termed vitamin B₁ and vitamin B₂. The extent of the rôle that vitamin B₁ plays in the etiology of beriberi and other diseases attributed to vitamin deficiency is still in the process of investigation. Although vitamin B₂ is usually associated with the causation of pellagra, more recent observations are not very convincing on that issue, and the chances are that it has less to do with the causation than was formerly thought.

The outstanding advance in knowledge pertaining to vitamin C is that it has been discovered in pure state and its chemical composition has been determined.

The International Journal of Orthodontia, Oral Surgery and Radiography

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY
THE C. V. MOSBY CO., 3523-25 Pine Blvd., St. Louis, Mo.

Foreign Depots—Great Britain—Henry Kimpton, 263 High Holborn, London, W. C.; Australasia—Stirling & Co., 317 Collins Street; Modern Chambers, Melbourne; India—"Practical Medicine," Egerton Street, Delhi; Porto Rico—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates—Single Copies, 75 cents. To any place in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, \$7.00 per year in advance. Under foreign postage, \$7.40. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, postoffice or express money order, payable to the publishers, The C. V. Mosby Company.

Contributions—The editor will be pleased to consider the publication of original communications of merit on orthodontic and allied subjects, which must be contributed solely to this Journal.

Opinions—Neither the editor nor the publisher hold themselves responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

Reprints—The publishers will communicate with authors regarding reprints upon publication of paper.

Communications—Contributed articles, illustrations, letters, books for review, and all other matter pertaining to the editorial department should be addressed to the Editor, Dr. H. C. Pollock, 4482 Washington Blvd., St. Louis, Mo. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 3523-25 Pine Blvd., St. Louis, Mo.

Illustrations—Such half-tones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

Advertisements—Objectionable advertisements will not be accepted for publication in this Journal. Forms close first of month preceding date of issue. Advertising rates and sizes on application.

Change of Address—The publishers should be advised of change of subscriber's address about fifteen days before date of issue with both new and old addresses given.

Nonreceipt of Copies—Complaints for nonreceipt of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply may be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second-Class Matter
Additional Entry at Fulton, Mo.

EDITORIALS

Elementary Orthodontic Education

AT the recent meeting of the American Society of Orthodontists at Toronto in May, a great deal was heard both formally and informally in regard to the present trend of orthodontic training and education.

At least one reason that the subject is attracting interest at this time is the increasing activity of some dental journals in publishing "tips" and short cuts in ostensibly orthodontic educational articles. Some of the so-called short cuts are good, but most of them are very bad and are opposed to the correct interpretation of basic orthodontic facts, as they are usually understood. The articles often definitely appear, to the modern trained orthodontist, to have been written by men who are lamentably amateurish, antiquated, or untrained in the subject.

For instance, an author advocates the extraction of maxillary first premolars on each side of the maxillary dental arch as a compromise treatment in Class II, division 1 cases. He suggests that the maxillary anterior teeth should then be moved distally by means of traction by the screw thread placed distal to the buccal tubes on the maxillary first molars. Such treatment is advocated and its efficacy explained, of course, on the presumption that it saves the patient expense and at the same time expedites the treatment. Casts which have been made before and after treatment are exhibited and to the uninitiated and untrained eye, make a good showing, probably on the basis that "the hand is quicker than the eye," or perhaps, and more to the point, they appear well, just as a fine coat of paint makes an old car look good.

Various and sundry other practices, equally absurd, are advocated from time to time. Writers who advocate these extraordinary and revolutionary methods are often sincere; at least it is easy to be charitable in our opinions in this regard. They apparently believe that what they advocate is good practice, and they sometimes assume the attitude that they have discovered something new. They even intimate that perhaps orthodontists are cranks, that orthodontists insist on treatment "according to Culbertson," and at great expense; furthermore, that orthodontists for the most part are idealists, and only a small proportion of patients can afford to enjoy ideal treatment, therefore they contend that here is a compromise which is sound practice, and so on and so forth. This line of reasoning perhaps appears logical to the novice, but every orthodontist with experience knows that compromise treatment (*sine ideals*) "cracks up" as the years roll by. These men have seen Angle Class II, division 1 infraclusion cases treated by extraction of the first premolars years previously, with no attempt to correct the distoclusion or infraclusion; they have also seen these maxillary anterior teeth extracted or relapsed later as a result of traumatic occlusion, and they learn after a period of years that osseous tissue does not remain *in situ* like so much concrete but acts more like a growing tree—it adapts itself to function.

In many instances these articles advocate short cut methods, principles and ideas entirely familiar to and within the knowledge of every orthodontist; but, as a rule, the orthodontist does not resort to short cut methods because he knows from experience and training that such methods make a spectacular and satisfactory temporary showing, but that in the ten-year span they mean very little. He knows that an (Angle) Class II, division 1 case corrected without correcting the distoclusion involved, or without correcting at the same time the overbite, means nothing. It may be granted that in some instances permanent corrections have been made by the extraction of the maxillary first or second premolars in Class II, division 1 cases, but not if the infraclusion has been ignored, and not if the anchorage to make such correction has been secured exclusively intermaxillary and stationary only. In the long pull this method terminates in the cure being worse than the disease, as evidenced in the mesial tipping and elongation of the maxillary first molars; this latter is noted not only immediately subsequent to treatment but years after treatment has been concluded.

Other articles advocate the use of silk grass line, wedges, string, ad infinitum,

things which for the most part have passed on as a result of their unsanitary, pathology-promoting proclivities, and which are now relics.

Men who devote much of their time to orthodontia have no quarrel, in fact they are in entire accord and sympathy, with extending up-to-date orthodontic information and education to the dental profession through the dental journals. However, they believe that this information should not be of the lamentably amateurish type which so many authors, presumably laboratory men, are extending in the field of orthodontia, and which is for the most part misinformation.

The state of Arizona has seen fit to place on its statute books a law which will prevent all dentists not registered for the practice of orthodontia from practicing it within the confines of that state subsequent to the year 1934. Upon seeking an explanation from the sponsors of this law as to why it has been necessary to place the law on the statute books, one sponsor explained carefully to the writer that the bulk of orthodontic treatment, particularly in America, is being done today by untrained and unskilled operators, that it is being done by practitioners in dentistry whose course in orthodontia has been secured in a dental school and that such a course is usually inadequate and a mere gesture. They contend, therefore, that the citizens of the state of Arizona should be protected as well from services at the hands of incompetent, untrained specialists. Therefore, a special orthodontic examining board and a special orthodontic statute are necessary in order that the children may be properly protected from incompetent service.

It would appear, in trying to reconcile the question of orthodontic education with the above mentioned general conditions, that the most important move to bring about a better state of affairs in orthodontic education would be to have better undergraduate courses in orthodontia in dental schools. Either that or no courses at all. The general practitioner of dentistry should be at least sufficiently well trained and well grounded in the subject of orthodontia that normally he will not be susceptible to orthodontic educational information which is, for the most part, sophomoric in character.

If we are to have tips in orthodontic practice broadcast, let us see that they are in accord with the fundamental principles of accepted orthodontic practices.

Orthodontic specialists, themselves, possibly should carry some of the responsibility for misinformation being published in the dental press. It is possible, in the voluminous material which has been written on orthodontic education, that there has been too much "looking at the sky and failing to see the clouds," too much overzealousness to be ultra scientific, and sometimes, perhaps, its resultant by-product of the pseudoscientific, the unwieldy, the impracticable, thereby obscuring the A B C's of the subject to the average dental practitioner who is avid for orthodontic information.

Contributions based upon the fundamental principles of the subject, no matter how much opposed to present views and no matter where published, are no doubt good and stimulate discussion. However, the advocacy of interpretations and methods which are contrary to all basic principles of the science of orthodontia as now practiced, is dangerous propaganda and is not good for the public or for the profession.

—H. C. P.

A National Dental Museum

AT THE meeting of the American Dental Association in 1930 at Denver a committee was appointed to study the feasibility of arranging a museum to house exhibits of interest to dentistry.

When the committee entered upon its duties, it was discovered that many years ago, in 1885 to be exact, the then National Dental Association had by resolution designated the Army Medical Museum at Washington, D. C., as the official depository for the dental profession of the United States.

A meeting with the Surgeon General of the United States Army and the committee was arranged, and he heartily approved of a plan to reawaken interest in the dental division of the Museum.

Plans were shown at this meeting detailing the project, which the government was preparing, to build a new museum and library at the Army Medical Center in Washington.

The part assigned to the Dental Museum was designed to occupy about five times as much floor space as in the present building.

The Committee on Museum then made a report to the American Dental Association in 1931 at Memphis, and the recommendations were that the American Dental Association revive interest in this Museum and make it the center of activities for this work in the United States.

This suggestion met with the approval of the Board of Trustees and the House of Delegates, and the Committee was directed to continue its activities and to arouse the interest of the dental profession in this Museum to the end that members of the profession would send specimens for classification, study or exhibit.

Members of the profession are urged to send any such material, either anatomical, casts, anomalies, or historical specimens to the Curator, Army Medical Museum, Dental Division, Washington, D. C.

As rapidly as specimens are received, they will be classified and indexed.

The Museum has facilities for accommodating properly accredited students, who may have access to the specimens arranged for study and access also to the thousands of slides of pathologic specimens.

It is hoped that the profession throughout the country will renew its interest in the Museum and support it.

NEWS AND NOTES

Greater New York December Meeting

The eighth annual Greater New York December Meeting will be held at the Hotel Pennsylvania, December 5-9, 1932.

This meeting will be under the auspices of the First and Second District Dental Societies of the State of New York, and will be dedicated to "Practical Dentistry."

CARROLL B. WHITCOMB, Chairman.

Sixty-Seventh Annual Meeting of Ohio State Dental Society

The Ohio State Dental Society will hold its 1932 meeting in Cleveland on December 5, 6, and 7. Arrangements are being made for a program of outstanding men in the various specialties of dentistry. The program will be divided into the four sections of dentistry, and the four sections will be in session at one time, thus insuring a maximum diversity of choice in the type of program.

EDWARD C. MILLS, Secretary,
255 East Broad Street,
Columbus, Ohio.

American Society of Oral Surgeons and Exodontists

The fourteenth annual meeting of the American Society of Oral Surgeons and Exodontists will be held in Buffalo, N. Y., at the Hotel Buffalo, September 9 and 10, 1932.

E. W. BROWNING, President,
921 Boston Building,
Salt Lake City, Utah.
HARRY BEAR, Secretary,
410 Professional Building,
Richmond, Virginia.

Southern Society of Orthodontists

The annual meeting of the Southern Society of Orthodontists will be held in Knoxville, Tenn., October 31, November 1 and 2, 1932.

GEORGE M. ANDERSON, Sec'y-Treas.,
831 Park Avenue,
Baltimore, Md.

Association of American Women Dentists

The eleventh annual meeting of the Association of American Women Dentists will be held at the Statler Hotel, Buffalo, New York, on September 12, 1932. A cordial invitation is extended to all women dentists.

GENEVA E. GROTH, Chairman Publicity
Committee,
1301 Medical Arts Bldg.,
Philadelphia, Pa.

American Dental Assistants Association

The Lafayette Hotel has been designated as headquarters for the Eighth Annual Meeting of the American Dental Assistants Association which will be held in Buffalo, New York, September 12-15, 1932. For further information address

RUTH M. CLARK, General Secretary,
Suite 1-4, Scofield Bldg.,
Minot, North Dakota.

American Congress of Physical Therapy Section on Stomatology

The eleventh annual scientific session of the American Congress of Physical Therapy will be held at the Hotel New Yorker, New York, September 6, 7, 8, and 9, 1932. A section on stomatology has been organized, and on September 9 a full day's program will be offered in this specialty.